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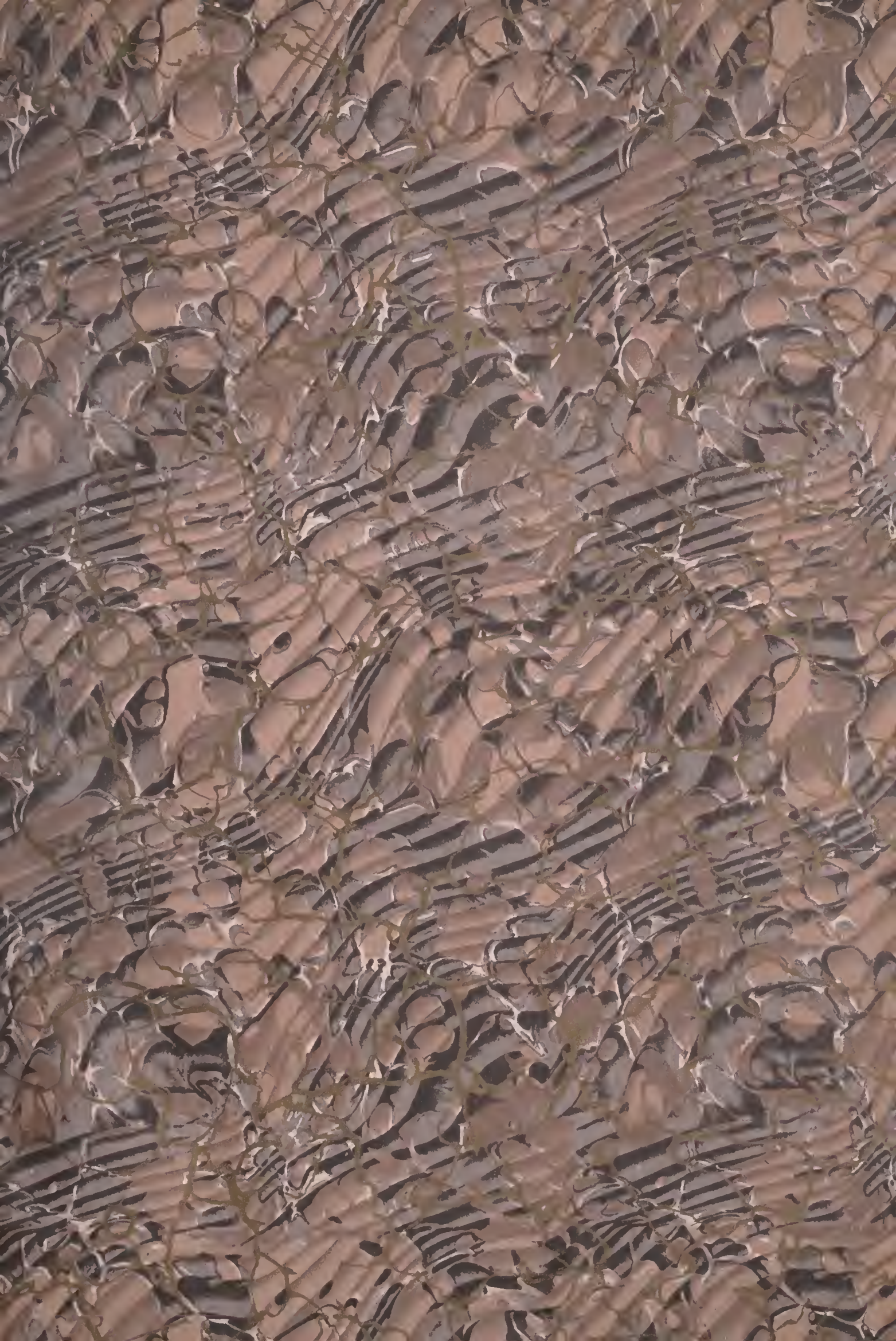



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STANDARD LOOSE LEAF ENCYCLOPEDIA

POTASH WATER, an aerated water produced by mixing bicarbonate of potash with carbonic acid water in the proportion of 20 grains to each bottle of the water, or about half an ounce to the gallon.

POTASSIUM (a latinized term from potash), a name given to the metallic basis of potash, discovered by Davy in 1807, and one of the first-fruits of his electro-chemical researches; symbol, K; atomic weight, 39.1. Next to lithium it is the lightest metallic substance known, its specific gravity, being 0.865 at the temperature of 60°. At ordinary temperatures it may be cut with a knife and worked with the fingers. At 32° it is hard and brittle, with a crystalline texture; at 50° it becomes malleable, and in luster resembles polished silver; at 150° it is perfectly liquid. Potassium has a very powerful affinity for oxygen, which it takes from many other compounds. A freshly-exposed surface of potassium instantly becomes covered with a film of oxide. The metal must therefore be preserved under a liquid free from oxygen, rock-oil or naphtha being generally employed. It conducts electricity like the common metals. When thrown upon water it decomposes that liquid with evolution of hydrogen, which burns with a pale violet flame, owing to the presence in it of potash vapor. Chloride of potassium is known in commerce as "muriate of potash," and closely resembles common salt (chloride of sodium). It is obtained from potassic minerals, the ashes of marine plants (kelp), and from sea-water or brine springs. It enters into the manufacture of saltpeter, alum, artificial manure, etc. Bromide and iodide of potassium are useful drugs. Bicarbonate of potassium is obtained by exposing a solution of the carbonate to the air, carbonic acid being imbibed from the atmosphere, and crystals being deposited; or it is formed more directly by passing a current of carbonic acid gas through a solution of the carbonate of such a strength that crystals form spontaneously. It is much used in medicine for making effervescing drinks. Nitrate of potassium is nitre, or saltpeter. Sulphate of potassium is used medicinally as a mild laxative, in making some kinds of glass and alum, and in manures. The bisulphate is used as a chemical reagent and in colico-printing and dyeing. Chlorate of potassium is employed in the manufacture of lucifer matches, in certain operations in colico-printing, and for filling friction-tubes for firing cannon. It is a well-known source of oxygen. The bichromate is also used in calico-printing and dyeing. Cyanide of potassium is much used in photography.

POTATO, a plant belonging to the natural order Solanaceæ, which also includes such poisonous plants as nightshade, henbane, thorn-apple, and tobacco. We owe this esculent to western South America, where it still grows wild

chiefly in the region of the Andes, producing small, tasteless, watery tubers. The potato is a perennial plant, with angular herbaceous stems, growing to the height of 2 or 3 feet; leaves pinnate; flowers pretty large, numerous, disposed in corymbs, and colored violet, bluish, reddish, or whitish. The fruit is globular, about the size of a gooseberry, reddish-brown or purplish when ripe, and contains numerous small seeds. The tubers, which furnish so large an amount of the food of mankind, are really underground shoots abnormally dilated, their increase in size having been greatly fostered by cultivation. Their true nature is proved by the existence of the "eyes" upon them. These are leaf-buds, from which, if a tuber or a portion of it containing an eye is put into earth, a young plant will sprout, the starchy matter of the tuber itself supplying nutriment until it throws out roots and leaves, and so attains an independent existence. The potato succeeds best in a light sandy loam containing a certain proportion of vegetable matter. The varieties are very numerous, differing in the time of ripening, in their form, size, color, and quality. New ones are readily procured by sowing the seeds, which will produce tubers the third year, and a full crop the fourth. But the plant is usually propagated by sowing or planting the tubers, and it is only in this way that any one variety can be kept in cultivation. Like all plants that are extensively cultivated and under very different circumstances of soil, climate, and artificial treatment, the potato is extremely subject to disease. Among the diseases to which it is liable are the "curl," the "scab," the "dry-rot," and the "wet-rot," besides the more destructive potato disease proper. The principal feature of the curl is the curling of the shoots soon after their first appearance. After that they make little progress, and sometimes disappear altogether. The plants produce no tubers, or only a few minute ones, which are unfit for food. The scab is a disease that attacks the tubers, which become covered with brown spots on the outside, while underneath the skin is a fungus called *Tubercinia scabies*. The dry-rot is characterized by a hardening of the tissues, which are completely gorged with mycelium (the vegetative part of fungi). In the disease called wet-rot the potato is affected much in the same way as by the dry-rot; but the tubers, instead of becoming hard and dry, are soft. The fungus present in wet-rot is supposed to be the same that accompanies dry-rot. The potato is also attacked by various insects, the most destructive being the Colorado beetle. The tubers consist almost entirely of starch, and being thus deficient in nitrogen, should not be too much relied on as a staple article of diet. Potatoes are extensively used as a cattle-food, and starch is also manufactured from them. A coarse spirit is also obtained from

them by distillation, the starch being converted into sugar by means of malt or sulphuric acid, and then fermentation set up.

POTATO-BUG, a name given in America to many insects injurious to



Colorado potato bug and its feeding larva.

the potato, such as the Colorado beetle, which see.

POTEMKIN (pot-yom'kin), Gregory Alexandrovitch, Russian general, a favorite of the Empress Catharine II., born in 1736, died in 1791. From 1776 till his death, a period of more than fifteen years, he exercised a boundless sway over the destinies of the empire. In 1783 he suppressed the khanate of the Crimea, and annexed it to Russia. In 1787, being desirous of expelling the Turks from Europe, he stirred up a new war, in the course of which he took Oczakoff by storm (1788). In the following year (1789) he took Bender, but as the finances of Russia were now exhausted Catharine was desirous of peace. Potemkin, however, resolved on conquering Constantinople, resisted the proposal to treat with the enemy, and went to St. Petersburg to win over the empress to his side (March, 1791); but during his absence Catharine sent plenary powers to Prince Repnin, who signed a treaty of peace. When Potemkin learned what had been done he set out for the army, resolved to undo the work of his substitute; but he died on the way, at Nicolaieff.

POTENTIAL ENERGY, that part of the energy of a system of bodies which is due to their relative position, and which is equal to the work which would be done by the various forces acting on the system if the bodies were to yield to them. If a stone is at a certain height above the earth's surface the potential energy of the system consisting of the earth and stone, in virtue of the force of gravity, is the work which might be done by the falling of the stone to the surface of the earth.

POTEN'ZA, a town of Southern Italy and a bishop's sec, capital of the province of the same name, on a hill of the Apennines near the Basento, 85 miles e.s.e. of Naples. Its chief productions are corn, hemp, wine, silk, cotton. Area, 4122 sq. miles; pop. 490,705.

POTO'MAC, a river of the United States, which forms the boundary between Maryland and Virginia, passes Washington, and after a course of nearly 400 miles flows into Chesapeake bay, being about 8 miles wide at its mouth. The termination of the tide-water is at Washington, about 125 miles from the sea, and the river is navigable for large

ships all that distance. Above Washington are several falls which obstruct navigation.

POTOSI (pot-o-sē'; common pronunciation, po-tō'sē), a city of Southern Bolivia, in the department of same name on the slope of the mountain mass of Cerro de Potosi, more than 13,000 feet above the sea-level, in bare and barren surroundings. It has long been celebrated for its silver-mines, which were at one time exceedingly productive, and have again begun to show an improved return. Pop. 15,000.—The department has an area of 54,000 sq. miles, and is celebrated for its mineral wealth, especially silver. Pop. 325,615

POTIPOURRI (pō-pō-rē), signifies the same as olla podrida; also, and more generally, a musical medley, or a literary composition made up of parts put together without unity or bond of connection.

POTSDAM, a town in Prussia, a bishop's see, capital of the province of Brandenburg, and the second royal residence of the kingdom, is charmingly situated in the midst of wooded hills, 17 miles southwest of Berlin, on the Havel, which here has several lakes connected with it. Potsdam was an unimportant place till the Great Elector selected it as a place of residence and built the royal palace in the town (1660-71). Pop. 58,452.

POTTER, Paul, a celebrated Dutch painter of animals, born at Enkhuysen in 1625. He died at Amsterdam in 1654, at the early age of twenty-nine. His engravings are much esteemed, and his paintings command a high price.

POTTER, Henry Codman, Episcopal bishop of the diocese of New York. He was born at Schenectady, N. Y., May 25, 1835, educated at the Episcopal academy in Philadelphia and at the



Bishop H. C. Potter.

Theological seminary of Virginia. His earlier charges were Christ church, Greensburg, Pa., in 1857; St. John's church at Troy, N. Y., in 1859; Trinity church, Boston, in 1866; and Grace church, New York, in 1868. He became bishop of New York in 1887, having been assistant bishop four years previously. He is well known as a lecturer. He died in 1908.

POTTERY, the art of forming vessels or utensils of any sort in clay. This art is of high antiquity, being practiced among various races in prehistoric times. We find mention of earthenware in the Mosaic writings. The Greeks had important potteries at Samos, Athens, and Corinth, and attained great perfection as regards form and ornamentation. The Italians are said first to have become acquainted with this kind of ware as it was manufactured in the Island of Majorca, and hence they gave it the name of majolica. About the middle of the 16th century the manufactory of Bernard Palissy at Saintes in France became famous on account of the beautiful glaze and rich ornaments by which its products were distinguished. A little later the Dutch began to manufacture at Delft the more solid but less beautiful ware which thence takes its name. The principal improver of the potter's art in Britain was Josiah Wedgwood in the 18th century. Porcelain or chinaware first became known in Europe about the end of the 16th century through the Dutch, who brought it from the East.

Though the various kinds of pottery and porcelain differ from each other in the details of their manufacture, yet there are certain general principles and processes which are common to them all. The first operations are connected with the preparation of the potter's paste, which consists of two different ingredients—an earthy substance, which is the clay proper; and a siliceous substance, which is necessary to increase the firmness of the ware, and render it less liable to shrink and crack on exposure to heat. The clay is first finely comminuted, and reduced to the consistency of cream, when it is run off through a set of wire, gauze, or silk sieves into cisterns, where it is diluted with water to a standard density. The other ingredient of the potter's material is usually ground flints, or flint-powder, as it is called. The flint nodules are reduced to powder by being heated and then thrown into water to make them brittle. They are then passed through a stamping-mill and ground to fine powder; which, treated in much the same way as the clay, is finally passed as a creamy liquor into a separate cistern. These liquors are now mixed in such measure that the dry flint-powder bears to the clay the proportion of one-sixth or one-fifth, or even more, according to the quality of the clay and the practice of the manufacturer. The mixture is then forced into presses, lined with cloth, by means of a force-pump, the cloth retaining the clay and allowing the water to escape. The clay now forms a uniform inelastic mass, which is cut into cubical lumps and transferred to a damp cellar, where it remains until a process of fermentation or disintegration renders it finer in grain and not so apt to crack in the baking. But even after this process the ingredients composing the paste are not intimately enough incorporated together nor sufficiently fine in texture until another operation has been undergone, called slapping or wedging, which consists in repeatedly breaking the lumps across and striking them together again in an-

other direction, dashing them on a board, etc. This final process of incorporation is now most frequently performed by machinery.

In making earthenware vessels, if they are of a circular form, the first operation after the paste has been made is turning, or what is technically called throwing them on the wheel. This is an apparatus resembling an ordinary turning-lathe, except that the surface of the chuck, or support for the clay, is horizontal instead of vertical. The chuck is in fact a



Successive stages of earthenware vessel on the potter's wheel.

revolving circular table, in the center of which a piece of clay is placed, which the potter begins to shape with his hands. The rotary motion of the table gives the clay a cylindrical form in the hands of the potter, who gradually works it up to the intended shape. It is then detached from the revolving table and dried, after which, if intended for finely-finished ware, it is taken to a lathe and polished. It is at this stage that the handles and other prominent parts are fitted on, which is done by means of a thin paste of clay called slip. The articles are now removed to a room in which they are dried more thoroughly at a high temperature. When they have reached what is called the green state they are again taken to a lathe and more truly shaped, as well as smoothed and burnished. When the articles are not of a circular form, and accordingly cannot be produced by means of the wheel, they are either pressed or cast in molds of plaster of Paris. In the former case the paste used is of the same consistency as that employed on the wheel; in the latter, molds of the same sort are used, but the clay mixture is poured into them in the condition of slip. By the absorption of the water in the parts next the dry mold a crust is formed of greater or less thickness, according to the time that the liquid is allowed to remain. The molds are in two or more pieces, so as to be easily detached from the molded article.

When shaped and dried the articles are ready for the kiln, in which they are exposed to a high temperature until they acquire a sufficient degree of hardness for use. The paste of which the earthenware is composed is thus converted into what is called bisque or biscuit. While undergoing this process of baking, the articles are inclosed in larger vessels of baked fire-clay, called saggars, to protect them from the fire and smoke,



MODERN GLASSWARE AND POTTERY.

and to distribute the heat more uniformly. The whole firing lasts from forty to forty-two hours. After the kilns have been allowed to cool very slowly, the articles are taken out, and if they are not to be decorated in color, and sometimes also when they are to be so decorated, they are immersed in a vitrifiable composition called glaze, which, after the vessels have been a second time subjected to heat in glazed



The muffle for fixing the colors on decorated porcelain.

saggers, is converted into a coating of glass, rendering the vessels impermeable to water.

Porcelain or chinaware is formed only from argillaceous minerals of extreme delicacy, united with siliceous earths capable of communicating to them a certain degree of translucency by means of their vitrification. Porcelain is of two kinds—hard and tender. Both consist, like other earthenwares, of two parts—a paste which forms the biscuit, and a glaze. The biscuit of hard porcelain is composed of kaolin or china clay, and of decomposed felspar. The glaze consists of a felspar rock reduced to a fine powder, and mixed with water, so as to form a milky liquid into which the articles are dipped after a preliminary baking. Tender porcelain biscuit is made of a vitreous frit, composed of siliceous sand or ground flints, with other ingredients added, all baked together in a furnace till half-fused, and then reduced to a condition of powder.

The manufacture of pottery, stoneware, and china has been established in the United States for many years, and is now conducted on the most extensive scale both at the east and in some portions of the west—notably at a pottery in Cincinnati, Ohio, where a very superior quality of ornamental china is included in the output. The principal depots for the manufacture of this commodity are at Trenton, N. J., and at East Liverpool, Ohio, where, it is said, fully nine-tenths of the capital employed in the production of pottery in the United States are invested. There are potteries also at East Boston, Mass.; Geddes, N. Y.; Green Point, L. I.; Peoria, Ill., and at various points in West Virginia, their lines of production grading from the ordinary descriptions of pottery to the best qualities of vitrified china. The trade catered to is domestic, and for some portions of Canada, South America, and Mexico.

POTTSTOWN, a town in Pennsyl-

vania, on the Schuylkill, between Philadelphia, and Reading. Pop. 15,120.

POTTSVILLE, a town in Pennsylvania, in the center of the great anthracite coal-fields, with blast-furnaces, forges, foundries, rolling-mills, machine factories, etc. Pop. 18,210.

POUGHKEEPSIE (po-kēp'si), a city in the state of New York, the capital of Dutchess county, situated on the east bank of the Hudson river, 74 miles north of New York City and 70 miles south of Albany. It is built partly on a slope, partly on a plateau, about 200 feet above the river, and is prettily situated. It is distinguished for its educational institutions, and is known as the "City of Schools." These include Vassar college for women, one of the chief institutions of the kind in America. Poughkeepsie was the seat of the convention of 1788, at which the federal constitution was adopted. Pop. 1909, 26,000.

POULTICE, in medicine, a soft moist application applied externally to some part of the body either hot or cold, but generally the former. The simple poultice is made with linseed meal and boiling water, spread out with uniform thickness on a cloth or rag, and is used where it is desired to hasten the progress of inflammation. Its moisture causes relaxation of the skin, and thereby lessens the discomfort or pain. It acts also as a counter-irritant, producing a redness and congestion of the skin. Disinfecting poultices are made with charcoal, mixed with linseed-meal and bread. The sedative poultice, made with beer, yeast, flour, and hot water, is generally used to relieve pain in cases of cancer. The best-known poultice, however, is the counter-irritant, commonly called a mustard-plaster. This may be made, by mixing linseed-meal with water, and adding mustard. It produces a rapid but mild counter-irritation, indicated by a redness of the skin and is very useful in cases of bronchitis, lumbago and similar affections.

POULTRY, a general name for all birds bred for the table, or kept for their eggs. The birds most commonly included under this designation are the common fowl, the pea-fowl, the guinea-fowl, the turkey, goose, and duck.

POUND, an English weight of two different denominations, avoirdupois and troy. The pound troy contains 5760 grains, and is divided into 12 ounces; the pound avoirdupois, contains 7000 grains, and is divided into 16 ounces. The pound, or pound sterling, the highest monetary denomination used in British money accounts, and equal to 20 shillings, was so called from originally being equal to a quantity of silver weighing one pound. The pound is strictly a money of account, the coin representing it being the sovereign. See Money.

POUSSIN, Nicolas, a distinguished French painter, born at Andelys in 1594. From 1640 to 1642 he resided in Paris; but the rivalry of French painters and the want of appreciation of his works induced him to return to Rome, where he lived until his death in 1665. Among his works are the Seven Sacraments, the Death of Germanicus, the Capture of Jerusalem, the Plague of the Philis-

tines, Abraham's Servant and Rebecca, the Adulteress, the Infant Moses, Moses Bringing Water from the Rock, the Worship of the Golden Calf, John Baptizing in the Wilderness, etc., and many fine landscapes.

POUTER, a variety of fancy pigeon, named for the habit of pouting or puffing



English pouter.

up the breast. They occur in many different color varieties. See Pigeon.

POWDERLY, Terrence Vincent, American labor leader, was born at Carbondale, Lackawana co., Pa., in 1849. In 1879 he was elected general master workman of the Knights of Labor, which he reorganized and greatly extended its interests. In 1893 owing to internal differences arising from opposition to his policy he resigned. In 1878, 1880, and 1882 he was elected mayor of Scranton as candidate of the labor greenback party, and in 1891 republican delegate-at-large to the projected state constitutional convention. He studied law in 1893-94, was admitted to the bar of Lackawanna co., Pa., in 1894, and to that of the United States supreme court in 1901. From 1897 until his resignation in 1902 he was United States commissioner-general of immigration. During the presidential campaigns of 1896 and 1900 he appeared as a republican stump speaker in the west and south.

POWELL, John Wesley, American geologist and anthropologist, was born at Mount Morris, N. Y., in 1834. In 1867 Major Powell visited the Rocky mountains of Colorado for exploration and research. In 1869 he induced Congress to establish a geological and topographical survey of the Colorado river and its tributaries, an undertaking which consumed the following ten years. He published in 1876 Contributions to North American Ethnology. In 1881 he was appointed director of the United States geological and geographical survey. In 1894 he resigned this office to devote himself to the directorship of the Bureau of Anthropology, and to ethnological and philosophical studies. He died in 1902.

POWELL, Robert Stephenson Smyth Baden-, English general, born in 1857. During the South African war of 1899-1902 he highly distinguished himself by

his defense of Mafeking from October, 1899, till his relief in May, 1900, for which he was promoted to the rank of major-general. Author of Pig-sticking, Reconnaissance, Cavalry Instruction, Downfall of Prempeh, Matabele Campaign, etc.

POWER OF ATTORNEY, in law, a written instrument whereby one person is authorized to act for another as his agent or attorney, either generally or in a special transaction.

POWERS, Hiram, American sculptor, born in 1805. He early displayed great ingenuity in mechanical matters, but having formed the acquaintance of a German sculptor, and having been taught modeling by him, he determined to become himself a sculptor. He produced busts of many American statesmen. His most famous ideal works are the statue of Eve, the Greek Slave, and the Fisher Boy. He died in 1873.

POWERS, The Great, a term of modern diplomacy, by which are now meant Britain, France, Austria, Germany, Italy, and Russia.

POYNTER, Sir Edward John, R. A., British painter, was born in Paris in 1836; was elected an associate in 1869 and a Royal Academician in 1876, became president and was knighted in 1896. He was the first Slade professor of art at University college, London. He is the author of Ten Lectures on Art (1879).

PRÆFECT, the title of various functionaries of ancient Rome. Of these the most important was the *præfectus urbi* or *urbis* (præfect of the city). During the kingly period and the early republic the *præfectus urbis* had the right to exercise all the powers of the king or consuls in their absence. After the foundation of the prætorship this office lost its dignity and privileges; but under the empire it was revived as that of chief permanent magistrate of the city, with important military functions.

PRÆTOR, an important official in the ancient Roman state. Up to 367 B.C. the title was merely an adjunct to that of consul; but when at that date the consulship was thrown open to the plebeians, the judicial functions of the consul were separated from his other duties and given to a new patrician magistrate, who was entitled the prætor.

PRÆTORIANS, the body-guard of the Roman emperors, first established as a standing body by Augustus. They were reorganized and their powers curtailed by Septimius Severus and by Diocletian, and were finally disbanded by Constantine the Great in 312 A.D.

PRAGMATIC SANCTION, a public and solemn decree pronounced by the head of a legislature. In European history several important treaties are called pragmatic sanctions, but the one best known by this name is the instrument by which the German emperor Charles VI., being without male issue, endeavored to secure the succession to his female descendants. It was in accordance with this instrument that he settled his dominions on his daughter Maria Theresa.

PRAGUE, the capital of Bohemia, a prosperous and well-built city near the center of the kingdom, on both sides of the Moldau, here crossed by seven bridges; 153 miles northwest of Vienna and 75

miles southeast of Dresden, with both of which it is connected by railway. Its site is a regular basin, cut in two by the river, from the banks of which the houses rise on both sides till they are terminated and inclosed by hills of considerable height. Among the public buildings of Prague are the old castle, or palace of the Bohemian kings; the Roman Catholic cathedral, the Teyn-*kirche* or old church of the Hussites, interesting as containing statues and other works of art and the burial-place of the astronomer Tycho Brahe; the palace of Wallenstein, originally a magnificent



View in Prague.

structure, but now much dilapidated, etc. Prague is one of the oldest towns in the kingdom, dating from the 8th century. Its university was founded in 1348, and had at one time about 10,000 students. Recently it was divided into two universities, a German and a Czech or Bohemian, having together more than 3500 students. During the Austro-Prussian war in 1866 Prague was occupied by the Prussians, and here the treaty of peace was signed on the 23d August. Pop. 201,589, or with suburbs 385,238, of whom about six-sevenths are Bohemians.

PRAIRIE, the name given in North America to the vast natural meadows or plains of the Mississippi valley, especially lying between it and the Rocky mountains, and extending northward into Central Canada. Throughout this immense territory the differences of level are sufficient to produce a steady flow of the rivers, but not so great as to obstruct their navigation, thus securing a unique system of easy inter-communication between all sections of the country. There is a great sameness in the features of the topography, the vegetable productions, the soil, and geological features. Some of the prairies that have a peculiarly undulating surface are known as rolling prairies. Immense tracts are cultivated, and produce large crops of wheat and corn with little outlay of labor on the part of the farmer.

PRAIRIE-DOG, or **MARMOT**, a

small rodent animal, the *wistonish*, allied to the marmot as well as to the squirrel, and found on the North American prairies west of the Mississippi and east of the Rocky mountains. These animals live gregariously in burrows, and are characterized by a sharp bark, like that of a small dog, whence their popular name. They are about 1 foot



Prairie-dogs.

in length exclusive of the tail, which is rather short. Their burrows are quite close together, and have a mound of excavated earth near the entrance, on which the little animals are wont to sit and look around them. These communities are termed "villages." The prairie-dog is not to be confounded with the prairie-squirrel, to which it is allied.

PRAIRIE-HEN, the popular name of the pinnated grouse of the United States. The neck of the male is furnished with neck-tufts of eighteen feathers, and is remarkable also for two loose, pendulous, wrinkled skins, which somewhat resemble an orange on inflation. The prairie-hen is much prized for the table.

PRAIRIE-SQUIRREL, or **GOPHER**, a name for several animals of North America, found in the prairies in great numbers. They live in burrows, and not on trees, and much resemble the prairie-dog or marmot. They have cheek-pouches, in which their food is carried. This consists of prairie plants with their roots and seeds.

PRAIRIE-WOLF, or **COYOTE**, the small wolf which is found on the prairies in North America, believed by many to be a mere variety of the European wolf. It is a cowardly animal, and only dangerous to man when in packs and pressed by hunger.

PRE-ADAMITES, those supposed inhabitants of the earth prior to the creation of Adam. Ancient legends or traditions of the East speak of nations and empires existing before Adam's creation, and of a line of kings who ruled over them. In modern times the subject was taken up by Isaac de la Peyrère, who, in a work published in 1655, maintained that the Jews were the descendants of Adam, and the Gentiles those of a long anterior creation, founding his opinions on Romans v. 12-14.

PRECEDENT, in law, a judicial decision which serves as a rule for future determinations in similar cases. Precedents, strictly speaking, are binding on tribunals only when they are actual decisions of the point in question; what is termed an extrajudicial opinion or *obiter dictum*—the opinion of a judge pronounced where it was not called for to decide the issue—can have authority only from the character of the judge, and not as a precedent. Precedents are now of as much authority in courts of equity as in those of common law.

PRECESSION OF THE EQUINOXES, a slow motion of the line of intersection of the celestial equator or equinoctial and the ecliptic, which causes the positions occupied by the sun at the equinox (the equinoctial points, which see) to move backward or westward at the mean rate of 50.25" per year. This motion of the equinox along the ecliptic carries it, with reference to the diurnal motion, continually in advance upon the stars; the place of the equinox among the stars, with reference to the diurnal motion, thus precedes at every subsequent moment that which it previously held, hence the name. This sweeping round in the heavens of the equinoctial line indicates a motion of the axis of rotation of the earth, such that it describes circles round the poles of the ecliptic in 25,791 years. Nutation is a similar, but much smaller gyratory motion of the earth's axis, whose period is about nineteen years. From these two causes in combination the axis follows a sinuous path, instead of a circle, about the pole of the ecliptic. Nutation causes the equinoctial points to be alternately in advance of and behind their mean place due to precession by 6.87". At present the vernal equinoctial point is in the zodiacal sign Pisces, and it is moving toward the sign Aquarius.

PRECIOUS METALS, a name commonly applied to gold and silver in contradistinction to such ordinary and abundant metals as iron, copper, lead.

PRECIPITATE, in chemistry, a solid body produced by the mutual action of two or more liquids mixed together, one or other of them holding some substance in solution. The term is generally applied when the solid appears in a flocculent or pulverulent form. Substances that settle or sink to the bottom like earthy matters in water are called sediments, the operating cause being mechanical, not chemical. Red oxide or peroxide of mercury is often called red precipitate.

PREDESTINATION, in theology, the term used to denote the degree of God, whereby the elect are foreordained to salvation. The theory of predestination represents God's absolute will as determining the eternal destiny of man, not according to the fore-known character of those whose fate is so determined, but according to God's own choice. This doctrine has been the occasion of many disputes and controversies in the church in all ages. On the one side, it has been observed that the doctrine of predestination destroys moral distinction, introduces fatalism, and renders all our efforts useless. On the other side, it is contended that if God's knowledge is infinite he must have known everything from eternity; and that the permission of evil under such circumstances is indistinguishable from a plan or decree under which it is fore-ordained. The first great champions of these opposite views were Pelagius and Augustine. The former held that there was a possibility of good in man's nature, and that the choice of salvation lay in man's will. Augustine maintained that apart from divine grace there is no possibility of good in human nature, and that since the fall man's will has no

power of choice. Predestination forms one of the peculiar characteristics of the Calvinistic theology; the question is left an open one by the Anglican church, and also by the Roman Catholic church since the reformation.

PRE-EXISTENCE, Doctrine of, the doctrine sometimes maintained that the soul of every man has an existence previous to that of his body. This opinion was very prevalent in the East, and was held by several Greek philosophers, more especially by the Pythagoreans, Empedocles, and also apparently by Plato. A similar doctrine has found some countenance in Christian times as an explanation of the union of soul and body. In favor of this theory appeal is made to these peculiar sensations which are sometimes raised by sights or sounds, which we feel conscious of having had a former familiarity with, though reason would persuade us we had seen them for the first time. The doctrine is supported by some modern German philosophers, particularly the younger Fichte.

PREFET (prā-fā), the title of an important political functionary in France, whose office was created in 1800 at the instance of Napoleon. There is a préfet at the head of each department, who is intrusted with the whole organization and management of the police establishments; but not with the punishment of police offenses.

PREGNANCY, the state of a female who is with child. It lasts in the human subject from 274 to 280 days; that is to say, that time should elapse from the moment of conception to the time of birth. Among the earliest signs of pregnancy are the stoppage of the monthly discharge, and sickness, usually felt in the early part of the day, and thus called "morning sickness." The latter usually begins about the fourth or fifth week, and may last all the time, but often diminishes in course of the fourth month. Changes in the breast are evident during the second month, the nipple becoming more prominent, and the dark circle round it being deeper in tint by the ninth week, little elevated points in it being more marked. Toward the fourth month enlargement of the belly becomes noticeable, and continues to increase regularly till delivery takes place. About the sixteenth or seventeenth week quickening occurs; that is, the mother becomes aware of movements of the child. None of these signs are, however, absolutely conclusive, as various conditions may give rise to similar signs or signs resembling them. The only conclusive evidence is the detection of the sounds of the child's heart, heard by applying the ear to the belly of the mother, midway between the naval and the line of the groins, a little to the right or left of the middle line. They may be detected about the eighteenth week. During pregnancy women should take regular meals of plain, nourishing food, avoiding rich and highly-seasoned dishes, and should restrain unwholesome cravings, which sometimes exist. Gentle but regular and moderate exercise should be engaged in, all undue exertion, effort, and fatigue being avoided. Clothing should be warm, woolen next the skin, and nowhere tight.

Prudence in baths must be exercised, too hot or too cold water being avoided, and the bowels must be kept well regulated, only the mildest medicine being used. Above all a calm and equable frame of mind should be cultivated, and there should be no hesitation in asking advice of the doctor.

PRELUDE, in music, originally the first part of a sonata; though, as the name implies, it may be an introduction to any piece of music. Bach and his contemporaries elaborated preludes considerably; and Chopin wrote several piano works which, though complete in themselves, he designated preludes. Latterly the term has been applied to operatic introductions when they are shorter than the usual overture. Wagner in particular has prefaced most of his operas with a prelude.

PREPOSITION, a part of speech which is used to show the relation of one object to another, and derives its name from its being usually placed before the word which expresses the object of the relation. In some languages this relation is often expressed merely by changes of the termination.

PRESBYTERIANS, a name applied to those Christians who hold that there is no order in the church as established by Christ and his apostles superior to that of presbyters, and who vest church government in presbyteries, or associations of ministers and elders, possessed all of equal powers, without any superiority among them. The Presbyterians believe that the authority of their ministers is derived from the Holy Ghost by the imposition of the hands of the presbytery; and they oppose the independent scheme of the common rights of Christians by the same arguments which are used for that purpose by the Episcopalians. They affirm that all ministers, being ambassadors of Christ, are equal by their commission; and that Episcopacy was gradually established upon the primitive practice of making the moderator, or speaker of the presbytery, a permanent officer. These positions they maintain against the Episcopalians by the general argument that the terms bishop and presbyter are used as synonymous terms in the New Testament, and that they were used simply to designate the minister appointed by the apostles to take charge of a new church on its foundation. They therefore claim validity for the ordination after the Presbyterian form, as there was originally no higher ecclesiastical than a presbyter in the church.

The first Presbyterian church in modern times was founded in Geneva by John Calvin about 1541; and the constitution and doctrines were thence introduced, with some modifications, into Scotland by John Knox about 1560, though the Presbyterian was not legally recognized as the national form of church government until 1592. For nearly a century after this date there was a continual struggle in Scotland between Episcopacy and Presbyterianism; until ultimately by the Treaty of Union in 1707 it was agreed on the part of England and Scotland that that form of church government should be the national form of ecclesiastical government

in Scotland, and that the Scotch church should be supported as the only one established by law.—The constitution of the Scotch church, and of the Presbyterian church generally, is as follows: The kirk-session is the lowest court, and is composed of the parochial minister, or ministers, if more than one, and of lay elders (usually from six to twenty) the minister, or senior minister where there are more than one, being president or moderator. This court exercises the religious discipline of the parish; but an appeal may be made from its decisions to the presbytery, and again from the presbytery to the synod. A presbytery consists of the pastors of the churches within a certain district, and of an elder connected with each, while the synod comprises the presbyteries within a certain area, their ministers and representative elders. The general assembly is the highest ecclesiastical court, its decisions being supreme. Besides the Established Church of Scotland there are other important religious bodies whose constitution is strictly Presbyterian, but who, from different principles, decline to have any connection with the state. The chief of these is the United Free church of Scotland, formed by the union of the Free and United Presbyterian churches.

Shortly after the reformation Presbyterianism was in considerable strength in England, a large number of the Puritans preferring this system to episcopacy, but it subsequently declined in strength. The rule of the Stuarts, however, did much to renew its vigor, and in 1642 the Long Parliament abolished episcopacy, a measure followed by the meeting of the famous assembly of divines at Westminster the following year. In 1646 presbytery was sanctioned by parliament, but it was never generally adopted, or regularly organized, except in London and Lancashire. Soon after the restoration episcopacy was restored, and about 2000 Presbyterian clergy were ejected from their cures in consequence of the Act of Uniformity in 1662. Presbyterianism has ever since been simply one of the forms of dissent in England, and has held no prominent position, though many Presbyterian churches are scattered throughout England. Of these by far the greater number are united to form a single body, the Presbyterian church of England.—The Presbyterian church in Ireland originated through the settlement of Scottish colonists in Ulster in the reign of James I. When Charles II. attempted to force Prelacy upon the Scotch many of them took refuge in the north of Ireland, which gave the cause of Presbyterianism in that country a fresh impulse. The favor shown them by William III. was of great assistance to them; which they repaid by the part they played in the rebellion under James II., particularly in the memorable siege of Londonderry. As a test of his gratitude the king doubled the sum given for the support of their ministers, hence known as *Regium Donum*; the act of 1869, however, which disestablished the Irish church, provided also for the discontinuance of this sum.—The Presbyterian church of the United States is un-

doubtedly to be reckoned as a daughter of the Church of Scotland. There are at present a number of different organizations of Presbyterians in the states; and the body is also an important one in Canada and the other British colonies, and on the European continent.

PRESBYTERY, a judicatory, consisting of the pastors of all the churches of any particular Presbyterian denomination within a given district, along with their ruling (i.e. presiding) elders, there being one ruling elder from each church-session commissioned to represent the congregation in conjunction with the minister. The functions of the presbytery are, to grant licenses to preach the gospel, and to judge of the qualifications of such as apply for them; to ordain ministers to vacant charges; to judge in cases of reference for advice, and in complaints and appeals which come from the church-sessions within the bounds of the presbytery; and generally to superintend whatever relates to the spiritual interests of the several congregations under its charge, both in respect of doctrine and discipline. Appeals may be taken from the presbytery to the provincial synod, and then to the general assembly.

PRESCOTT, George Bartlett, American electrician, was born at Kingston, N. H., in 1830. In 1852 he discovered that the aurora borealis is an electric phenomenon. He invented an improvement in telegraph insulators in 1872; with Thomas A. Edison invented and introduced the duplex telegraph and the quadruplex telegraph; and also introduced from Europe the system of sending messages in pneumatic tubes. He died in 1894.

PRESCOTT, William Hickling, American historian, born in Salem, Massachusetts, 1796; died 1859. Acquaintance with Spanish literature, which he began to cultivate in 1824, led him to attempt his first great work on Spanish history, the *Reign of Ferdinand and Isabella*, published 1837. It was received with enthusiasm both in America and Europe; was rapidly translated into French, Spanish, and German; and its author was elected a member of the Royal academy at Madrid. Prescott's next work was the *History of the Conquest of Mexico*, with a *Preliminary View of the Ancient Mexican Civilization*, and the *Life of the Conqueror Hernando Cortez*, which appeared in 1843, and was received with an equal degree of favor. In 1847 he published the *History of the Conquest of Peru*, with a *Preliminary View of the Civilization of the Incas*. In 1855 the first two volumes of the long-expected *History of the Reign of Philip II., King of Spain*, appeared, and proved to the public equally acceptable with Prescott's former works. In 1858 was published a third volume; but the sudden death of the author from apoplexy put a stop to his labors. Prescott affords a remarkable instance of the success of indomitable industry and perseverance, carried out in spite of the affliction of partial and latterly almost total blindness.

PRESCRIPTION, in medicine, is the form with directions, in which a medicine or medicines are ordered or pre-

scribed by a medical man. The several medical substances which may be contained in a prescription are distinguished by names indicative of the office performed by each. These are: 1. The basis, which is the principal or most active ingredient. 2. The adjuvant, or that which is intended to promote the action of the basis. 3. The corrective, intended to modify its action. 4. The excipient, or that which gives the whole a commodious or agreeable form. To these certain writers add a fifth, the intermedium, which is the substance employed to unite remedies which do not mix with each other or with the excipient, such as yolk of eggs and mucilage, employed in the preparation of emulsions. In choosing the form of a prescription it should be borne in mind that solutions and emulsions generally act with more certainty and rapidity than powders diffused through water; and these again than the semi-solid and solid forms of medicine.

PRESERVED PROVISIONS, MEATS, ETC., the preservation of dead organized matter from the natural process of decay is a most useful means of increasing and diffusing the food supply of the world. Animals, vegetables, and fruits may all be easily preserved for this purpose. The preserving of fruits is an old and familiar process. This is generally effected by boiling or stewing, though drying is also frequently resorted to, where the fruit is meant to be kept intact. Fruits intended for confectionery are preserved in four different ways: 1. In the form of jam, in which the fruit is boiled with from one-half to about equal its weight of sugar. 2. In the form of jelly, in which the juice only is preserved by being carefully strained from the solid portions of the fruit, and boiled with a third to a half of its weight of sugar. 3. By candying, which consists in taking the fruits whole or in pieces, and boiling them in a clear syrup of sugar previously prepared. They absorb the syrup, which is then crystallized by the action of a gentle heat. 4. By stewing them in a weak syrup of sugar and water till they become soft but not broken, and transferring them with the syrup to jars, adding pale brandy equal in quantity to the syrup. Several kinds of vegetables, as cabbages, cucumbers, cauliflowers, onions, are preserved by pickling. Antiseptics are used to preserve meats also, salting being the most common process. But to preserve large quantities of vegetable and animal products for food purposes, and at the same time to keep them nearly in their fresh state, they must be subjected to one of three processes. These are—drying, refrigeration, and exclusion of air. With vegetables, which contain so large an amount of water in proportion to their solid and nutritious material, the process of drying is peculiarly applicable, and it is largely employed as the means of furnishing fresh vegetable food for ships in a compact and portable form, when, in addition to desiccation, compression is also employed. The preservation of articles of food by the application of cold is the simplest of all known methods, and in such climates as North America, Russia, etc., it is largely taken

advantage of. In 1875 ice began to be used to preserve fresh meat in considerable quantities, which was sent from America to Europe. The modern methods of refrigeration for carrying purposes consist of an air-tight room on board ship, where the meat is kept, and through which dry cold air is made to circulate by means of special machinery driven by steam, the air being first compressed and cooled, and a further cooling taking place when it is again allowed to expand.

The process of preservation by exclusion from the action of atmospheric air is yearly assuming more importance and being more largely practiced. The most perfect method, and that which is now most generally resorted to, is the inclosure of the food in air-tight cases from which the air is then expelled; upon the perfection of the air-excluding process depends entirely the preservation of the article. The plan now generally adopted is commonly known as canning, and is applicable alike for flesh-meats, vegetables, and fruits. The process is usually as follows: The provisions of whatever kind are packed into a tin cylinder, and the interstices filled in with water or other appropriate fluid, as gravy in the case of flesh-food. The lid, which is perforated with a small aperture or pin-hole, is soldered carefully down. The cases are then set in a bath of solution of chloride of calcium; heat is applied until the whole boils, and the air is thus expelled through the pin-holes. These holes are then hermetically closed, and the canister and its contents are once more subjected to the operation of heat until the provisions are perfectly cooked. When it has become cool the canister is coated over with paint and removed to the proving room, an apartment the temperature of which has been raised to the degree of temperature most favorable to decomposition. If the operation has been successfully per-

formed, the ends or sides of the canisters will have fallen in to some extent from the outward pressure of the air. If, after the interval of some days, the ends bulge out, it is a certain sign that the process has not been successful, the liberated gases causing the outward pressure. Such cases should be rejected or submitted again to the process. Not only may boiled provisions be preserved in this way, but roast meats also. An improvement on this process has been effected by introducing into the canisters a small quantity of sulphite of soda which causes the absorption of any traces of free oxygen which may lurk in the cases.

PRESS, Correction of the. See Correction of the Press.

PRESS, Liberty of the, the liberty of every citizen to print whatever he chooses, which at the same time does not prevent his being amenable to justice for the abuse of this liberty. The right of printing rests on the same abstract grounds as the right of speech, and it might seem strange to a man unacquainted with history that printing should be subjected to a previous censorship, as it is in some states, and has been in all, any more than speaking, and that the liberty of the press should be expressly provided for in the constitutions of most free states. But when we look to history we find the origin of this, as of many other legislative anomalies, in periods when politics, religion, and individual rights were confusedly intermingled. It is only since men's views of the just limits of government have become clearer that the liberty of the press has been recognized as a right; and to England we are particularly indebted for the establishment of this principle. The existence of a censorship of the press was for centuries, however, deemed an essential to the safety of all European governments. Liberty of printing, as we understand it,

is a comparatively modern notion; Milton's plea for a free press met with no response from his own party, nor for very many years later was it the cue of any party in the English commonwealth to refrain from suppressing the writings of their political opponents. In England the liberty of the press, soon after printing was introduced, was regulated by the king's proclamations, prohibitions, charters of license, etc., and finally by the court of Star-chamber. The long parliament, after their rupture with Charles I., assumed the same power. The government of Charles II. imitated their ordinances, and the press did not really become free till the expiration of the statutes restricting it in 1693, after which it was found impossible to pass new laws in restraint of it, and it has remained free ever since, the last restriction being done away with on the abolition of the newspaper stamp duty, in 1856. Such legal checks as remain are merely intended to prevent outrages on religion or decency, to protect subjects from defamation, and to conserve the copyright of authors. The constitutions of many of the United States declare, as we should expect, for liberty of the press. The same may be said of all the South American republics. Among European countries, it may be generally said the liberty of the press is found most predominant among the weaker powers, such as Spain, Turkey, Sweden, and Norway, Switzerland, and Roumania; in France the press may be said to be comparatively free; while in Germany, Austria, and particularly in Russia, there are still many restrictions. In the British colonies the law is as in England, but in India the governor-general exercises a censorship. See Books (Censorship of).

PRESSBURG, or **PRESBURG**, a town in Hungary, 35 miles east of Vienna, beautifully situated on the left bank of the Danube, and on spurs of the Little

PRESIDENTS OF THE UNITED STATES.

	Name	Birthplace	Year	Paternal Ancestry	Residence	Inaugurated		Politics	Place of Death	Year	Age
						Year	Age				
1	George Washington.....	Westmoreland Co., Va.	1732	English.....	Va.....	1789	57	Fed.....	Mt. Vernon, Va.....	1799	67
2	John Adams.....	Quincy, Mass.....	1735	English.....	Mass.....	1797	62	Fed.....	Quincy, Mass.....	1826	90
3	Thomas Jefferson.....	Shadwell, Va.....	1743	Welsh.....	Va.....	1801	58	Rep.†....	Monticello, Va.....	1826	83
4	James Madison.....	Port Conway, Va.....	1751	English.....	Va.....	1809	58	Rep.....	Montpelier, Va.....	1836	85
5	James Monroe.....	Westmoreland Co., Va.	1758	Scotch.....	Va.....	1817	59	Rep.....	New York City.....	1831	73
6	John Quincy Adams.....	Quincy, Mass.....	1767	English.....	Mass.....	1825	58	Rep.†....	Washington, D. C.....	1848	80
7	Andrew Jackson.....	Union Co., N. C.*.....	1767	Scotch-Irish.....	Tenn.....	1829	62	Dem.....	Hermitage, Tenn.....	1845	78
8	Martin Van Buren.....	Kinderhook, N. Y.....	1782	Dutch.....	N. Y.....	1837	55	Dem.....	Lindenwood, N. Y.....	1862	79
9	William H. Harrison.....	Berkeley, Va.....	1773	English.....	Ohio.....	1841	68	Whig.....	Washington, D. C.....	1841	68
10	John Tyler.....	Greenway, Va.....	1790	English.....	Va.....	1841	51	Dem.....	Richmond, Va.....	1862	72
11	James K. Polk.....	Mecklenburg Co., N. C.	1795	Scotch-Irish.....	Tenn.....	1845	50	Dem.....	Nashville, Tenn.....	1849	53
12	Zachary Taylor.....	Orange Co., Va.....	1784	English.....	La.....	1849	65	Whig.....	Washington, D. C.....	1850	65
13	Millard Fillmore.....	Sumnerhill, N. Y.....	1800	English.....	N. Y.....	1850	50	Whig.....	Buffalo, N. Y.....	1874	74
14	Franklin Pierce.....	Hillsboro, N. H.....	1804	English.....	N. H.....	1853	49	Dem.....	Concord, N. H.....	1869	64
15	James Buchanan.....	Cove Gap, Pa.....	1791	Scotch-Irish.....	Pa.....	1857	66	Dem.....	Wheatland, Pa.....	1868	77
16	Abraham Lincoln.....	Larue Co., Ky.....	1809	English.....	Ill.....	1861	52	Rep.....	Washington, D. C.....	1865	56
17	Andrew Johnson.....	Raleigh, N. C.....	1808	English.....	Tenn.....	1865	57	Rep.....	Carter's Depot, Tenn.....	1875	66
18	Ulysses S. Grant.....	Point Pleasant, Ohio.....	1822	Scotch.....	D. C.....	1869	47	Rep.....	Mt. McGregor, N. Y.....	1885	63
19	Rutherford B. Hayes.....	Delaware, Ohio.....	1822	Scotch.....	Ohio.....	1877	54	Rep.....	Fremont, Ohio.....	1893	70
20	James A. Garfield.....	Cuyahoga Co., Ohio.....	1831	English.....	Ohio.....	1881	49	Rep.....	Long Branch, N. J.....	1881	49
21	Chester A. Arthur.....	Fairfield, Vt.....	1830	Scotch-Irish.....	N. Y.....	1881	51	Rep.....	New York City.....	1886	56
22	Grover Cleveland.....	Caldwell, N. J.....	1837	English.....	N. Y.....	1885	48	Dem.....	.....	.....	..
23	Benjamin Harrison.....	North Bend, Ohio.....	1833	English.....	Ind.....	1889	55	Rep.....	Indianapolis, Ind.....	1901	67
24	Grover Cleveland.....	Caldwell, N. J.....	1837	English.....	N. Y.....	1893	56	Dem.....	.....	.....	..
25	William McKinley.....	Niles, Ohio.....	1843	Scotch-Irish.....	Ohio.....	1897	54	Rep.....	Buffalo, N. Y.....	1901	58
26	Theodore Roosevelt.....	New York City.....	1858	Dutch.....	N. Y.....	1901	43	Rep.....	.....	.....	..

*Jackson called himself a South Carolinian and his biographer, Kendall, recorded his birthplace in Lancaster County, S. C., but Parton has published documentary evidence to show that Jackson was born in Union County, N. C., less than a quarter mile from the South Carolina line. †The Democratic party of to-day claims lineal descent from the first Republican Party and President Jefferson as its founder. ‡Political parties were disorganized at the time of the election of John Quincy Adams. He claimed to be a Republican, but his doctrines were decidedly Federalistic. The opposition to his Administration took the name of Democrats and elected Jackson President.

Carpathians. Pop. 65,867, fully more than half of whom are Germans, and 5400 Jews.

PRESTON, a municipal, parl., and county borough of England, in Lancashire, 27 miles northeast of Liverpool, agreeably situated on a height above the right or north bank of the Ribble. Population 112,982.

PRESIDENT, the supreme executive officer of the United States. The qualifications of a person raised to this dignity are to be a natural-born citizen of the age of 35 years, and to have resided 14 years within the United States. The election is by electoral colleges in every state. In his legislative capacity the president has the power of approving bills sent to him after passing congress, or of returning them to the house in which they originated. In his executive capacity he is commander-in-chief of the army and navy; his powers are prescribed in the constitution. He holds his office for four years, and is eligible for re-election. The table on preceding page gives the presidents in the order of their succession.

PRESIDENTIAL SUCCESSION, THE. The presidential succession is fixed by chapter iv of the acts of the forty-ninth congress, first session. In case of the removal, death, resignation, or inability of both the president and vice-president, then the secreatry of state shall act as president until the disability of the president or vice-president is removed or a president is elected. If there be no secretary of state, then the secretary of the treasury will act; and the remainder of the order of succession is as follows: The secretary of war, attorney-general, postmaster-general, secretary of the navy, and secretary of the interior. The secretary of agriculture and secretary of commerce and labor were added by subsequent enactment. The acting president must, upon taking office, convene congress, if not at the time in session, in extraordinary session, giving twenty days' notice. This act applies only to such cabinet officers as shall have been confirmed by the senate, and are eligible under the constitution to the presidency.

PRETORIA, the capital of the Transvaal, in South Africa, situated in a valley, 4500 feet above sea-level, 1040 miles by railway from Cape Town, 349 from Delagoa bay. There are government buildings, English cathedral, and other churches, market buildings, museums, etc. Pop. 15,000.

PREVENTION OF CRUELTY TO ANIMALS. See Animals, Cruelty to.

PRI'AM, in Greek legend, the last king of Troy, the son of Laomedon. By his second wife, Hecuba, he had, according to Homer, nineteen children, the most famous being Hector, Paris, Cassandra, and Troilus. His name has been rendered famous by the tragical fate of himself and his family, as a result of the Trojan war. When he was extremely old the Greeks demanded of him the restoration of Helen, who had been carried away by Paris, and on his refusal to give her up they made war against Troy, and took and destroyed the city, after a siege of ten years. Homer gives no account of the death of Priam; but other poets represent him to have been slain

at the altar of Zeus by Pyrrhus the Greek.

PRIB'YLOV, or **PRIBYLOFF**, **ISLANDS**, a group of islands on the coast of Alaska, United States, in Behring sea. The largest are St. Paul, St. George, Walrus, and Beaver islands. They are frequented by numbers of fur-seals. The natives are Aleutians.

PRICKLY ASH, a name given to several prickly shrubs of the United States. They have an aromatic and pungent bark, which from being used as a remedy for toothache gains them the name of toothache-tree.

PRICKLY PEAR, otherwise called Indian fig, is a fleshy and succulent



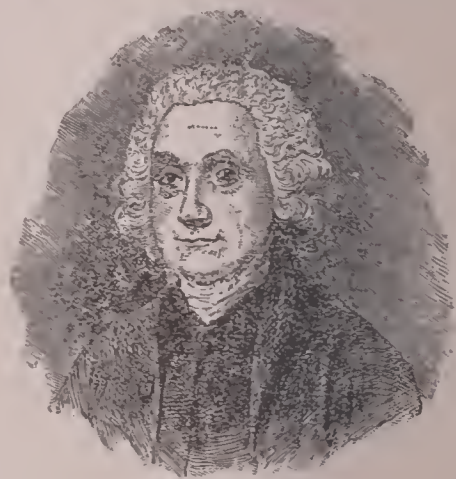
Prickly pear.

plant, destitute of leaves, covered with clusters of spines, and consisting of flattened joints inserted upon each other. The fruit is purplish in color, covered with fine prickles, and edible. The flower is large and yellow. It is a native of the tropical parts of America, whence it has been introduced into Europe, Mauritius, Arabia, Syria, and China. It is easily propagated, and in some countries is used as a hedge-plant. It attains a height of 7 or 8 feet.

PRIEST, in its most general signification, a man whose function is to inculcate and expound religious dogmas, to perform religious rites, and to act as a mediator between worshippers and whatever being they worship. In some countries the priesthood has formed a special order or caste, the office being hereditary; in other countries it has been elective. In sacred history the patriarchal order furnishes an example of the family priesthood. Abraham, Isaac, and Jacob perform priestly acts, and "draw near to the Lord," as also does Job, and the Arab sheikh to this hour unites in his person the civil and religious headship. The Mosaic priesthood was the inheritance of the sons of Aaron, of the tribe of Levi. The order of the priests stood between the high-priest on the one hand and the Levites on the other. The ceremony of their consecration is described in Exodus xxiv. and Leviticus viii. They wore a special dress, and their actions were in many cases prescribed strictly by the Mosaic law. In the New Testament believers generally are regarded as having the character of priests, and it is held by many Protestants that the idea of a consecrated priesthood invested with sacrificial functions is repugnant to Christianity. In some churches, therefore, the name priest is not used, minis-

ter, pastor, etc., being the term employed instead. Those Christians, however, who, like the Roman Catholics, Greeks, etc., look upon the eucharist as a sacrifice, regard the priest as performing sacrificial duties, and as standing in a special relation between God and his fellow-men. The priests of the Church of Rome are bound to a life of celibacy; but in the Greek church a married man may be consecrated a priest. In the Angelican and other Episcopal churches the priests form the second order of clergy, bishops ranking first. Diverse views of the priestly office are held in the Angelican and allied churches.

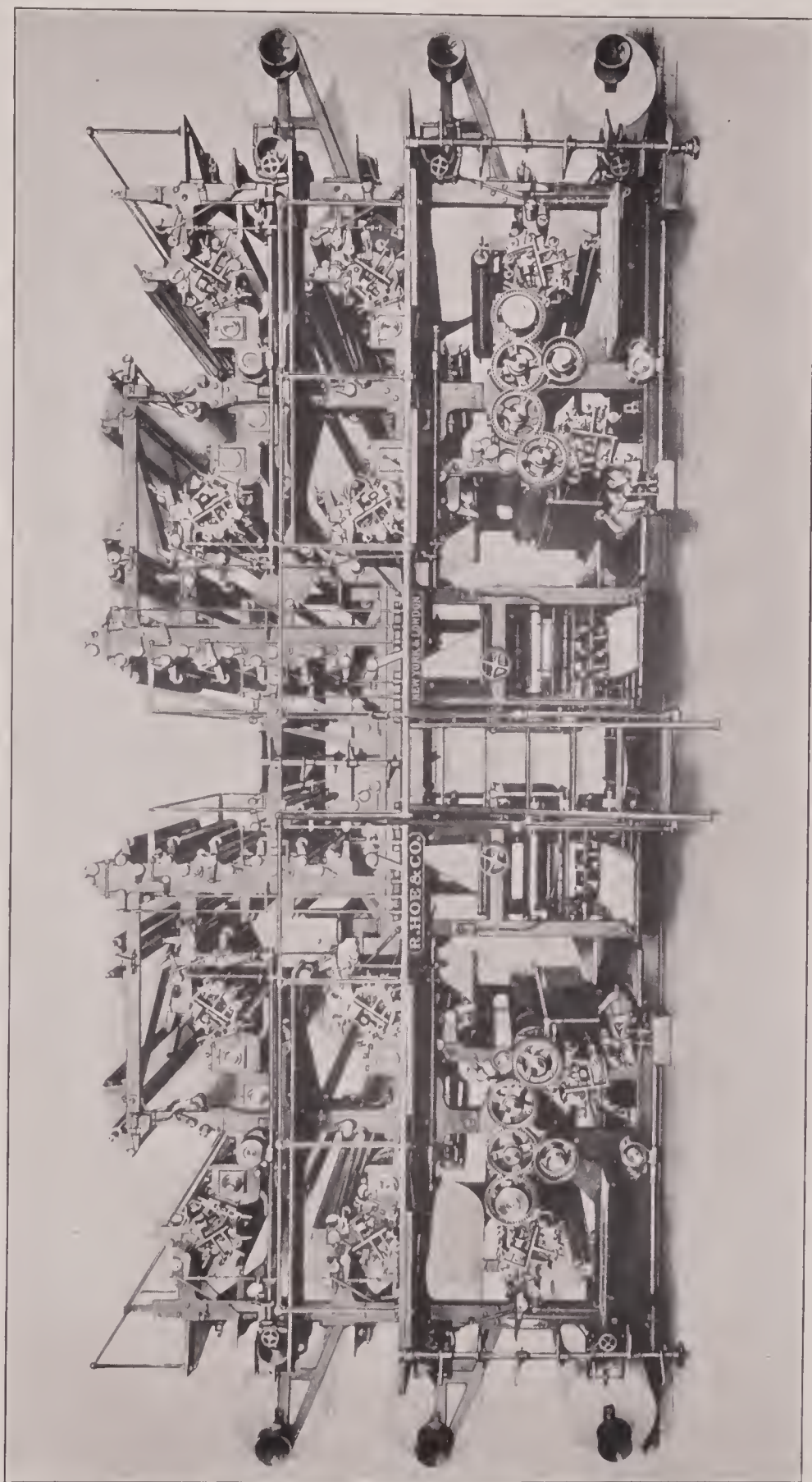
PRIESTLEY, Joseph, an English philosopher and divine, was born in 1733 near Leeds. In 1761 he became a teacher in the Dissenting academy at Warrington, and while here wrote a History of Electricity, which gained him admission to the Royal Society, and the degree of LL.D. from the University of Edinburgh. In 1767 he became minister of the Mill Hill chapel at Leeds, where his religious opinions became decidedly Socinian. While here he published his History and Present State of Discoveries relating to Vision, Light, and Colors (1772), his next important work being Institutes of Natural and Revealed Religion (1772-74). In 1774 he discovered oxygen, or "dephlogisticated air," as he called it, a result which was quickly followed by other important discoveries in chemistry. He died in 1804.



Joseph Priestley.

PRI'MARY, in geology, a term applied by the early geologists to rocks of a more or less crystalline structure, supposed to owe their present state to igneous agency. They were divided into two groups: stratified, consisting of gneiss, mica schist, argillaceous schist, hornblende schist, and all slaty and crystalline strata generally; and unstratified, these being chiefly granite. By geologists of the present day the term primary is used as equivalent to palæozoic, the name given to the oldest known group of stratified rocks, extending from the Pre-cambrian to the Permian formation. See Geology.

PRI'MATE, in the early Christian church the title assumed by the bishop of the capital of a province, and hence equivalent to metropolitan. In Africa the title belonged to the bishop who had been longest ordained. In France the



Double sextuple stereotype perfecting press. Capacity per hour, 96,000 12-page papers, 72,000 16-page papers, 48,000 24-page papers.

Archbishop of Lyons was appointed primate of the Gauls by Gregory VII. in 1079. In the German empire the Archbishop of Salzburg was primate. In the Church of England both the archbishops still retain the title of primate, the Archbishop of Canterbury being distinguished as the primate of all England, and the Archbishop of York as the primate of England. In the Protestant Episcopal church of Ireland the Archbishop of Armagh is primate, as formerly when the church was established.

PRIMA'TES (-tēz), the highest order or group of the mammalia, including the orders bimana and quadrumana, and thus placing man, monkeys, apes, and lemurs in one great division.

PRIMOGENITURE, the right of the eldest son and those who derive through him to succeed to the property of the ancestor. In the United States no distinction of age or sex is made in the descent of estates to lineal descendants.

PRIMROSE, a genus of beautiful low Alpine plants, natural order Primulaceæ. Some are among the earliest flowers in spring, as the common primrose, the oxlip, and cowslip; and several Japanese and other varieties are cultivated in



Primrose.

gardens as ornamental plants. Their roots are perennial; the leaves almost always radical; and the flowers supported on a naked stem, and usually disposed in a sort of umbel. The varieties of the common primrose which have arisen from cultivation are very numerous.

PRIMULA'CEÆ, the primrose order of plants, a natural order of monopetalous exogens, distinguished by the stamens being opposite to the lobes of the corolla, and having a superior capsule with a free central placenta. It consists of herbaceous plants, natives of temperate and cold regions. Many have flowers of much beauty, and some are very fragrant. See Primrose.

PRINCE, literally one who holds the first place. In modern times the title of prince (or princess) is given to all sovereigns generally, as well as to their sons and daughters and their nearest rela-

tions. In Germany there is a class of sovereigns, ranking next below the dukes, who bear the title of prince (Fürst) as a specific designation; members of royal families are, however, denominated Prinzen. On the continent there are many ancient families not immediately connected with any reigning house who bear the title of prince.

PRINCE EDWARD ISLAND, an island forming a province of the Dominion of Canada, in the Gulf of St. Lawrence, and separated by Northumberland strait from New Brunswick on the east and Nova Scotia on the south; greatest length, from east to west, about 130 miles; breadth, varying from 4 to 34 miles; area, about 2134 sq. miles, or 1,365,760 acres, of which over 1,000,000 are under cultivation. The island is supposed to have been discovered by Cabot. It was first colonized by France, captured by Britain in 1745, restored and recaptured, and finally in 1873 was admitted to the Dominion of Canada. Pop. 103,258.

PRINCE OF WALES, the title of the heir-apparent of the British throne, first conferred by Edward I. on his son (afterwards Edward II.) at the time of his conquest of the Principality of Wales. Edward III. was never Prince of Wales, but the title has been conferred on all the male heirs-apparent to the English (and afterward the British) throne from Edward the Black Prince, son of Edward III.

PRINCETON UNIVERSITY, an institution of higher education at Princeton, N. J., founded in 1746. It was called the College of New Jersey and was situated at Elizabethtown, and removed to Newark, where the first commencement was celebrated in 1748. In 1752 it was voted that the college be fixed at Princeton. In 1754 the cornerstone was laid for the first building, which was named Nassau Hall. The college was completed and the students removed from Newark to Princeton in the fall of 1756.

The government of the university is in the hands of a board of trustees under the presidency of the Governor of New Jersey. The university is organized in three departments, the Academic, the school of science, and the graduate school. The college course embraces instruction in the three departments of philosophy, language and literature, mathematics, and natural science. The graduate department offers over 200 courses of study leading to the master's and doctor's degree in arts and science.

The university provides pecuniary aid to deserving students through a large number of endowed scholarships and charitable funds. In 1902 Woodward Wilson became its president.

PRINCIPIA (Lat., principles). A famous mathematical treatise in Latin, by Sir Isaac Newton (1687). It consists of three parts, two on the motions of bodies and one on the solar system, and contains the full development of Newton's great discovery, the principle of universal gravitation.

PRINTING, in a general sense, is the art of stamping impressions of figures, letters, or signs, with ink, upon paper, vellum, cloth, or any similar substance; but the term is also applied to the pro-

duction of photographs from negatives, where neither ink nor pressure is used. Printing may be done (1) from engraved metal plates, in which the ink is stored for transference in the sunk or incised lines of the pattern (see Engraving); (2) from a level surface, as, polished stone, where the ink is confined to the lines by a repellent medium (see Lithography); or (3) from surfaces in relief, where the ink is transferred from the raised characters, which may be either on one block or on separate or movable types. The latter method is so much the more important that it gives its restricted meaning to the term printing, unless where otherwise qualified.

It is a matter of much dispute to whom is due the merit of adopting movable types. The invention has long been popularly credited to Johan Gutenberg, but critical examination of early Dutch and German specimens and historical evidence would seem to point to Laurens Janszoon Coster of Haarlem as the first inventor. The date of the Haarlem invention is variously placed between 1420 and 1430. Coster's types were first of wood, then of lead, and lastly of tin; the first book printed from movable types being probably one entitled *Speculum Nostræ Salutis*. Gutenberg in 1449 connected himself with a rich citizen in Mainz, named Johann Fust or Faust, who advanced the capital necessary to prosecute the business of printing. Soon after (probably in 1453) Peter Schöffer, who afterward became Fust's son-in-law, was taken into copartnership, and to him belongs the merit of inventing matrices for casting types, each individual type having hitherto been cut in wood or metal. The oldest work of any considerable size printed in Mainz with cast letters, by Gutenberg, Fust, and Schöffer, finished about 1455, is the Latin Bible, which is called the Forty-two-lined Bible, because in every full column it has forty-two lines; or the Mazarin Bible, from a copy having been discovered in the library of Cardinal Mazarin in Paris.

The art of printing was first introduced into England by William Caxton, who established a press in Westminster Abbey in 1476.

The various letters and marks used in printing are cast on types or rectangular pieces of metal, having the sign in relief on the upper end. These types, with the low pieces required to fill up spaces, are placed in cells or boxes in a shallow tray or case in such way that any letter can be readily found. The cases are mounted on a stand or frame, so that they may lie before the person who is to select and arrange the types, technically styled a compositor. The Roman types used are of three kinds: an alphabet of large capitals (A B C etc.), one of small capitals (A B C etc.), and one of small letters (a b c etc.), called lower-case by the compositor. Of italic characters only large capitals and lower-case are used. Besides these there are many varieties of letter, such as Old English, and imitations of manuscript letters, the mention of which could only be serviceable to the prac-

tical printer. Types are of various sizes, the following being those in use among British printers for book work:—English, Pica, Small Pica, Long Primer, Bourgeois, Brevier, Minion, Nonpareil, Pearl, Diamond. English has 5½ lines and Diamond 17 lines in an inch. See Type.

The main part of the work of a compositor consists in picking up types from their respective boxes, as required to give the words in the author's manuscript that has been supplied to him. The types are lifted by the right hand and placed in a composing stick held in the left. The composing stick is a sort of box wanting one side, and having one end movable to enable it to be adjusted to any required length of line. When the words in the stick have increased till they nearly fill the space between the ends they are "spaced out," that is, the blanks between the words are so increased or diminished as to make them exactly do so. Line is in this way added to line till the stick is full, when it is emptied on to a flat board with edges, called a galley. Subsequently the column of types so produced is divided into portions of definite length; these are furnished with head-lines and folios, and become pages. See Type Setting Machines.

The first printing press in America was set up in 1536, by Antonio de Mendoza, Viceroy of Mexico, and in 1638 the first press in our country was established at Harvard college, the second at Philadelphia in 1685, and the third in New York in 1693.

The process of printing is as follows: The pages of type to be printed are locked up with iron or wedge-shaped boxwood blocks called quoins in a steel frame called a "chase." Books are usually printed in sheets of sixteen pages or multiples of sixteen, and when locked in the chase ready for printing it is called a form. The surface of the type is covered with ink by composition rollers, which are made from a mixture of molasses, glue, glycerine, etc., boiled together and cast in brass molds.

The first printing press was made by Conrad Saspach, a turner, in 1436, under the direction of Gutenberg. The contemplation of a wine press gave Gutenberg the first conception of a printing press. The essential feature of the first press was a movable flat board, platen, as now called. The form was laid upon a movable bed, inked with balls, the paper placed upon it and pushed under the platen which was brought down upon it by a powerful screw, squeezing the paper upon the form. In 1683, Moxon, the first technical writer on printing, speaks of a newly invented press, meaning the old wooden press improved by Blaeu of Amsterdam. From this time until Earl Stanhope enlarged and improved the hand press about 1800, improvements were slow. In 1772 a rotary press was patented in England by Adkin & Walker, for the purpose of "stamping and printing on paper, cotton, and other cloths, whereby the printing on such material would be greatly facilitated and rendered much less expensive and more perfect and exact." In 1790, William Nicholson, of

London, editor of a scientific journal, took out a patent for a press, which foreshadowed nearly every fundamental principle in the improved presses of today, even to the use of curved plates fastened upon a cylinder, and, the use of small form rollers feeding from a large one. Nicholson never constructed a press, however, and his patent was merely a forecast of modern methods.

In 1818 Edward Cowper invented several improvements, including a flat ink-distributing table, ink fountain, distributing and form rollers. In the same year König patented a perfecting press (by which both sides of the sheet was printed at the rate of 750 papers per hour). Cowper also improved on this. The principle of these presses was used for years with improved methods for carrying the sheets. Robert M. Hoe, the American inventor, made marked and practical improvements increasing the capacity of presses. Mr. Hoe, in 1847, made a rotary press which would print about 20,000 papers an hour on one side. Then the invention of William A. Bullock of Philadelphia, which printed complete from a roll or web, followed. This was improved on by Walters of London, but the Hoe presses soon distanced all, and to-day a press constructed by R. Hoe & Co., when running at full capacity, uses eight rolls of paper, each four newspaper pages wide. This machine requires 125 horse-power to drive it, and when running at its full capacity consumes in an hour about 70 miles of paper the width of the roll, or 280 miles of paper the width of the newspaper page. In addition to the eight rolls of paper already mentioned eight other rolls are in position, so that when any of the rolls run out the roll-carrier may be turned on a turntable, and the new roll of paper quickly pasted to the end of the depleted roll. The running speed of this press is 96,000 papers an hour—four, six, eight, ten, twelve, fourteen or sixteen pages—or 48,000 eighteen, twenty, twenty-two, twenty-four, twenty-six, twenty-eight, thirty, or thirty-two page papers, all delivered, folded to half-page size, pasted, and counted. Other rotary presses of merit are made in this country, and in France and Germany, but they contain no distinctive principle that calls for minute description.

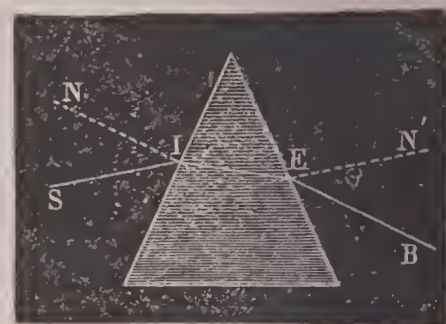
PRIOR, a title somewhat less dignified than that of abbot, formerly given to the head of a small monastery, designated a priory. Similarly the term prioress was applied to the head of a convent of females. See Abbey.

PRIOR, Matthew, an English poet, the son of a joiner, born in 1644, and educated at Westminster school. He died in 1721 and was buried in Westminster Abbey. Prior was endowed with much wit and power of satire; and many of his lighter pieces are charming, but his serious performances fail in moving either the feelings or the fancy.

PRISCIA'NUS, usually known as Priscian, a celebrated Roman grammarian, who lived in the latter half of the 5th century of our era, and of whom little more is known than that he was born at Cæsarea, taught grammar at

Constantinople in the time of Justinian, and wrote the *Institutiones Grammaticæ*, an exposition of Latin grammar. His work, successively abridged by several writers, formed the basis of instruction in Latin up to the 15th century, and there exist at present about one thousand MSS. of it, none dating before the 9th century. It contains numerous quotations from Latin authors now lost.

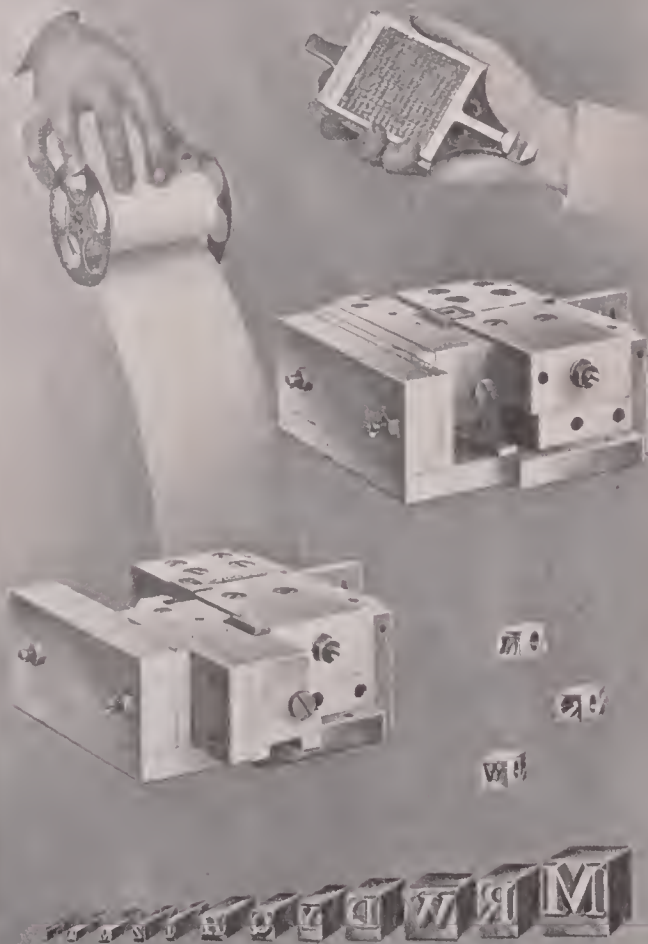
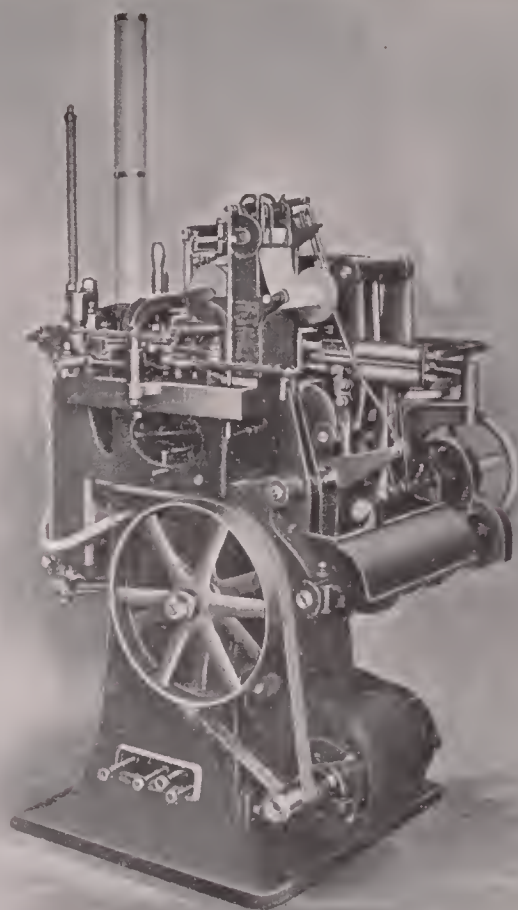
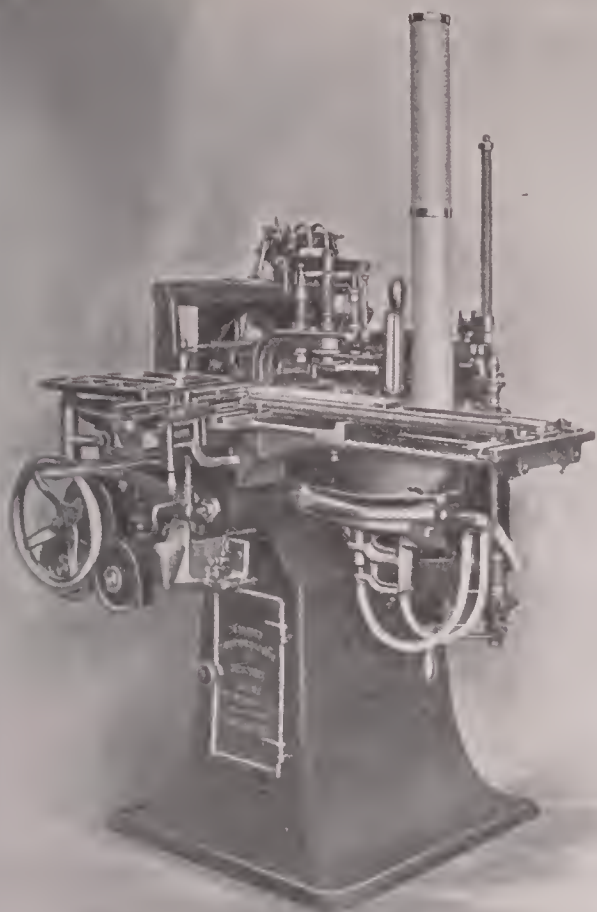
PRISM, in geometry, a solid figure which might be generated by the motion of a line kept parallel to itself, one extremity of it being carried round a rectilinear figure. A "right prism" is one in which the faces are at right angles to the ends. In optics a prism is a trans-



Light passing through prism.

parent body having two plane faces not parallel to each other, and most commonly it is made of glass, and triangular in section, the section forming either a right-angled, equilateral, or isosceles triangle. The two latter varieties are most familiar. If a ray of light, *s i*, enter such a prism by one of the two principal faces, it is bent in passing through so as to take the direction by *s i e b*. The angle which the ray in the prism makes with the normal, *n i*, is always smaller than the angle of incidence, *n i s*, and the angle which it makes with the normal, *e n'*, is smaller than the angle of emergence, *n' e b*, the ray being always bent toward the base of the prism. Not only is the ray thus bent, but it is also decomposed, and by suitable arrangements could be exhibited as made up of what are usually known as the seven primary colors: violet, indigo, blue, green, yellow, orange, and red.

PRISON, a house in which a person is confined and thereby deprived of his personal liberty; especially a building for the confinement or safe custody of criminals, debtors, or others. Imprisonment is now one of the recognized methods of judicially punishing certain crimes; but formerly it was employed in nearly every country in Europe for purposes of injustice and oppression. Men were hidden in dark dungeons, where in a short time they perished, through the inefficiency of the law to protect those who were offensive to the powerful; and even in Great Britain, where the laws have always condemned the incarceration of the innocent, the prison was, by the connivance of the authorities, made subservient to gross injustice and cruelty. To the 18th century belongs the honor of initiating the proper regulation of imprisonment. In Britain parliamentary inquiries



THE MONOTYPE TYPESETTING MACHINE.

Casting Machine, front view.
Keyboard.

Casting Machine, back view.
Monotype Parts.

brought out strange revelations as to the horrors of the debtors' prisons; but public interest in the subject was only effectually aroused by the extraordinary exertions of the celebrated John Howard, who in 1773 began, without any official standing, to make inspections of the chief English prisons. He found these places not only insanitary and ill-ventilated, but filthy, poisonous, and in nearly every case overcrowded. Disease was rampant, and no measures were taken to prevent its spread; many of the prisons were utterly unfit for human creatures to live in: and, to crown all, such intercourse was allowed between the prisoners as ensured the reduction of all to the level of the most corrupt and criminal. Howard's revelations caused such a feeling throughout the country that prison reformation could no longer be delayed. The result was that parliament entrusted a committee of three (of whom Howard was one) with the duty of framing a suitable scheme for the future management of the prisons. The chief features recommended were—solitary confinement, cleanliness, medical help, regular work and the enforcement of order—the same principles, indeed, which are now adopted by every civilized state in the world.

PRIVATEER, a vessel of war owned and equipped by private individuals to seize or plunder the ships of an enemy. Such a vessel must be licensed by government and under a letter of marque, otherwise she is a pirate. The letters of marque were first granted in England during the reign of Henry V., in view of the war with France; and they were issued to aggrieved subjects in order that they might compensate themselves for injury done by foreigners. It was probably in deprecation of irresponsible warfare of any kind that the powers agreed to abandon privateering in 1856.

PRIVY COUNCIL, the council of state of the British sovereign, convened to concert matters for the public service, and for the honor and safety of the realm. The English privy-council may be said to have existed from times of great antiquity; but the concilium ordinarium, established by Edward I., was the parent of the modern institution.

PRIZE, anything captured in virtue of the rights of war. Property captured on land is usually called booty, the term prize being more particularly used with reference to naval captures. The right of belligerents to capture the property of their enemies on the sea is universally admitted, as well as the right to prevent violation of the law of nations by neutrals, so long as the independence of other nations is not interfered with. It is accordingly settled as a principle of the law of nations that every belligerent has a right to establish tribunals of prize, and to examine and decide upon all maritime captures; and likewise that the courts of prize of the captors have exclusive jurisdiction over all matters relating to captures made under the authority of their sovereign. The sentence of a court of competent jurisdiction once pronounced is conclusive and binding on all nations.

PROA, a peculiar kind of sailing-boat

used in the Malay or eastern Archipelago and the Pacific. It is variously constructed, but regularly has one side quite flat, on a line with the stem and stern, while the other side is curved in the usual way; and being equally sharp at stem and stern, it sails equally well in either direction without turning. Their shape and small breadth of beam would render them peculiarly liable to upset were it not for the outrigger they carry, adjusted sometimes to one side and sometimes to both sides. The outrigger in the example here shown is a large



Proa, with outrigger.

structure supported by and formed of stout timbers. The outrigger may have weights placed on it and adjusted according to circumstances. Proas carry a lugsail generally of matting.

PROBATE, in law, the official proof of a will, that is the proceeding by which it is established as the last will and testament of the party whose will it professes to be.

PROBATE COURT, an English tribunal established by act of parliament in 1857, to which all the powers previously exercised by the ecclesiastical courts in the granting of probates of wills and letters of administration were transferred. This court was merged in the supreme court by the Judicature Act of 1874, by which its jurisdiction was assigned to a probate, divorce, and admiralty division. The functions of this branch are confined entirely to deciding on the authenticity of wills and upon the proper persons to whom administration is to be committed when no will exists. The practice of the court is thrown open to the whole legal profession, and its proceedings are otherwise assimilated to the courts of common law.

In many of the United States probate tribunals are distinct courts, with original and extensive jurisdiction not only over the probate of wills and the administration of decedents' estates, but over the appointment of guardians to minor and other legally incompetent persons, over petitions for the adoption of children, and the change of names. They are always inferior courts, from whose decisions appeals may be taken to higher tribunals. For their jurisdiction and powers, the statutes in each state must be consulted.

PROBOSCIS, the term applied to the longer or shorter flexible muscular organ formed by the elongated nose of several mammals. Although seen in a modified degree in the tapirs, etc., the term is

more generally restricted, and applied to indicate the flexible "trunk" of the elephant.

PROBOSCIS MONKEY, or **KAHAU**, a native of Borneo, distinguished particularly by its elongated nose, its shortened



Kahau.

thumbs, and its elongated tail. The general color is a lightish red. These monkeys are arboreal in habits, and appear to frequent the neighborhood of streams and rivers, congregating in troops.

PROBUS, Marcus Aurelius, one of the ablest of the Roman emperors, was born at Sirmium in the year 232. His skilful administration and public virtues did not protect him from enmity; and after a short reign he was murdered in a military insurrection in 282.

PROCONSUL and **PROPRÆTOR**, originally, in the ancient Roman system of administration, a consul or prætor whose command (or imperium) was prolonged for a particular purpose after his demission of office. In course of time the terms came to be applied to any one who was intrusted with some special service, and with magisterial authority for the purpose of performing it. Proconsuls and proprætors were generally men who had been consuls or prætors, but were not always so. There were four varieties of proconsul: 1. A distinguished statesman, formerly consul, appointed for a special duty. 2. An individual, who had never been consul, was sometimes created proconsul to be sent on some important mission. 3. A consul occasionally had his imperium prolonged, in order to complete some undertaking he had commenced. 4. A consul appointed after his term of office to the government of a province. The proconsuls under the republic had no authority within the walls of Rome, and they lost their imperium on entering the city. Under the empire the emperor was always invested with proconsular authority.

PROCTER, Bryan Waller, an English poet and prose writer, born about 1789; died in London, October 4, 1874. His daughter, Adelaide Ann, born in London in 1825, died in 1864, was a poetess of some note. Her songs and hymns show much taste and feeling, but she never attempted anything on a large scale. Her best-known volume is *Legends and Lyrics*, published in 1858.

PROCTOR, Redfield, American political leader and cabinet officer, was born

at Proctorsville, Vt., in 1831. He served throughout the civil war, rising to be colonel of the Fifteenth Vermont. He served several terms in the state legislature, from 1876-8, as lieutenant governor, and from 1878-80 as governor. In 1889 he entered the cabinet of President Harrison as secretary of war. He resigned in 1891 to accept an appointment as United States senator, which office he held until 1905. He died in 1908.

PROCTOR, Richard Anthony, astronomer, born at Chelsea in 1837, and educated at King's college, London, and Cambridge university. Having devoted himself specially to the study of astronomy, he published a number of valuable works on the subject, including *Saturn and its System*, *Handbook of the Stars*, *Half Hours with the Telescope*, *Half Hours with the Stars*, *Other Worlds than Ours* (a very popular work), *Light Science for Leisure Hours*, *The Transits of Venus*, *The Cycloid and Cylcoid Curves*, several *Star Atlases*, *The Universe of Stars*, *The Moon*, *Old and New Astronomy*, etc., besides two treatises on whist. He died in 1888.

PROCURATOR, among the ancient Romans, a provincial officer who managed the revenue of his province. In some of the small provinces, or in a part of a large province, the procurator discharged the office of a governor, and had the power of punishing capitally, as was the case with Pontius Pilate in Judæa, which was attached to the province of Syria.

PROFESSOR, the title given to salaried teachers in universities and similar institutions who are appointed to deliver lectures for the instruction of students in some particular branch of learning.

PROGNOSIS, in medicine the pre-judgment of the physician regarding the probable course and result of a disease. Such a judgment is based upon the known character of the disease modified by the age, sex, environment, previous health, etc., of the patient.

PROHIBITION PARTY. The prohibition party is a political organization that during recent years has occupied a position of no inconsiderable importance among the political parties of the United States. The principles of the party first found expression in Maine during 1851, when the state adopted a law prohibitory in its character that yet remains on the statute book. On various occasions since 1867 conventions have been held, and since 1869 those convening have nominated candidates for the presidency of the United States, as also for state and county offices. In 1890 the Supreme Court of the United States in a case on appeal from Iowa, decided that the transportation of liquor through, and the sale of liquor in original packages could not be prohibited in any of the states or territories of the United States, and that the statute of Iowa prohibiting the sale of liquors in the state was in violation of the constitution of the United States. In the elections held in November, 1907, local option was nearly everywhere successful in the southern, central and western states, including some of the larger cities. The conclusions, after a thorough

investigation, are: That prohibition has abolished or prevented the manufacture of liquor on a large scale, that the suppression of retail trade is dependent upon local sentiment, and is more successful in the country than in the city.

PROJECTILES, Theory of, is that branch of mechanics which treats of the motion of bodies thrown or driven some distance by an impelling force, and whose progress is affected by gravity and the resistance of the air. The most common cases are the balls projected from cannon or other firearms. If thrown horizontally, the body will move in a curved path, because it retains unchanged (leaving out of account the resistance of the air) its horizontal velocity, while it falls faster and faster toward the ground. A body projected obliquely has initially a certain horizontal velocity and a certain vertical velocity. It retains its horizontal velocity unchanged, but its vertical velocity is altered by the force of gravity, and in both of these cases we find that the path of the projectile is a parabola. With a given velocity the greatest range of a projectile is obtained by projecting at an angle of 45° with the vertical. The actual path of a bullet is always within the parabola of the theoretical projectile, and hence the range of a gun is much less than what the parabola would give. The range depends also upon the shape and weight of the projectile as well as upon its initial velocity. See *Gunnery*.

PROJECTION, the representation of something by means of lines, etc., drawn on a surface, especially the representation of any object on a perspective plane, or such a delineation as would result were the chief points of the object thrown forward upon the plane, each in the direction of a line drawn through it from a given point of sight or central point. This subject is of great importance in the making of maps, in which we have to consider the projection of the sphere or portions of it. Projections of the sphere are of several kinds, according to the situations in which the eye is supposed to be placed in respect of the sphere and the plane on which it is to be projected.

PROLETARIAT, the name which was given to those Roman citizens who, in the classification of their means by Servius Tullius, stood in the sixth or lowest class. The term has been revived in modern times as a designation of the lowest class of the community; but more frequently the collective appellation proletariat is used.

PROMEROPS, a genus of insectivorous birds, many of which are remarkable for the beauty of their plumage. They have a longish bill, an extensible tongue, and feed upon insects, soft fruits, and the saccharine juices of plants. One species is a native of New Guinea; another is a native of Africa.

PROMETHEUS, in Greek mythology, one of the Titans, brother of Atlas and of Epimetheus, and the father of Deucalion. His name means "forethought," as that of his brother Epimetheus signifies "afterthought." He gained the enmity of Zeus by bringing fire from heaven to men, and by conferring other benefits on them. To punish this offense Zeus

sent down Pandora, who brought all kinds of diseases into the world. He caused Prometheus himself to be chained by Hephæstus (Vulcan) on a rock of the Caucasus (the eastern extremity of the world, according to the notions of the earlier Greeks), where his liver, which was renewed every night, was torn by a vulture or an eagle. He was ultimately delivered by Heracles, who destroyed the vulture, unlocked the chains, and permitted Prometheus to return to Olympus.



Promerops.

PRONG-BUCK, or PRONG-HORN ANTELOPE, a species of antelope, which inhabits the western parts of North America. It frequents the plains in summer and the mountains in winter. It is one of the few hollow-horned antelopes, and the only living one in which the horny sheath is branched, branching being otherwise peculiar to deer which have bony antlers.

PROOF IMPRESSION, in printing, a rough impression from types, taken for correction. A first proof is the impression taken with all the errors of workmanship. After this is corrected another impression is printed with more care to send to the author: this is termed a clean proof. When this is corrected by the author, and the types altered accordingly, another proof is taken and carefully read over: this is called the press proof. In engraving, a proof impression is one taken from an engraving to show the state of it during the progress of the work; also, an early impression, or one of a limited number, taken before the letters to be inserted are engraved on the plate.

PROPAGATION, the multiplication or continuation of the species of animals or plants. As a technical term it is used chiefly in regard to plants. The most common method of propagating plants is of course by their seed. There are other ways, however, by which plants are propagated naturally. Some, for example, throw off runners from their stems which creep along the ground, and these runners take root at the buds, and send up new plants. The commonest artificial methods of propagating plants are budding, layering, the various forms of grafting, including inarching or grafting by approach, propagation by offsets and by slips. Some plants (as the potato) are propagated by dividing the tubers or underground stems, each "eye" or leaf-bud of which sends up a new plant, while a few are propagated by cuttings of the leaves.

PROPHETS, among the Hebrews, inspired teachers sent by God to declare his purposes to his people. From the time of Samuel frequent mention is made of a body of men bearing the general name of prophets. They were members of a school in which young men of all the tribes were instructed in the law, and apparently also in sacred poetry and music. The first school of this nature appears to have been set up by Samuel at Ramah, and there is mention of others at Bethel, Jericho, Gilgal, and elsewhere. It is probable that these schools of the prophets were formed to strengthen the attachment of the Jews to their religion, and to maintain that religion pure. The chief function of the prophetic order was to maintain the Mosaic theocracy in its purity, and the patriotism which strongly characterizes all the Hebrew prophets was closely connected with their religious zeal. The Jewish people being the chosen of God and the immediate subjects of the divine ruler, it is the constant cry of the prophets that the people should turn to righteousness in order to be delivered from the hands of their enemies. The predictive powers of prophets have been the occasion of much controversy. The ability of the prophets to foretell the future was generally believed in by the Jews, and in one passage of the Old Testament, Deut. xviii. 22, is made a negative test of the justness of a person's claim to be a prophet. The main controversies with regard to this predictive power turn upon two points—first, the reality of the power, which is by some altogether denied; and secondly, the reference of the prophecies. With regard to the reference of the prophecies the chief controversy is connected with the prophetic writings of the Old Testament supposed to relate to the Messiah. Regarding these prophecies three different positions are taken up by different schools of Biblical critics. Those who deny to the prophets the power of foretelling future events altogether necessarily deny also the reference of the prophecies in question to Christ as the Messiah. Another school, while admitting the reference of at least some of the passages to historical events, contend that in their secondary meaning they have also a reference to the Messiah. The third school hold that none but the Messianic interpretation is permissible.

PROPRÆTOR. See Prætor, Proconsul.

PROPYLÆA, in Greek architecture, the entrance to a temple. The term was employed particularly in speaking of the superb vestibules or porticoes conducting to the Acropolis of Athens. This magnificent work, of the Doric order was constructed under the direction of Pericles (B.C. 437–433) after the designs of Mnesicles, one of the most celebrated architects of his age.

PROPYLON. See Pylon.

PROSCENIUM, the part in a theater from the curtain or drop-scene to the orchestra; also applied to the curtain and the ornamental framework from which it hangs. In the ancient theater it comprised the whole of the stage.

PROSCRIPTION, in Roman history, a mode of getting rid of enemies, first re-

sorted to by Sulla in 82 B.C., and imitated more than once afterwards in the stormy years that closed the republic.

PROSE, ordinary spoken or written language, untrammelled by poetic measure, and thus used in contradistinction to verse or poetry. The true character of prose can be clearly conceived only by considering it in relation to poetry. The two chief states of the inward man may be called the thinking and the poetical states, and depend upon the predominance of the understanding, or the imagination and feelings. If we think (in the narrower sense of the word) we combine ideas according to the laws of reason; and prose, which is the language of sober thought, is characterized by the abstractness and precision belonging to ideas that occupy the understanding. Artistic and finished prose is among the latest attainments both of nations and individuals, and it would appear that with most nations classical prose writers are fewer than classical poets.

PROSELYTE, a person who leaves one religion for the profession of another. The Jews, in New Testament times at least, had two classes of proselytes, namely, the "proselytes of the gate," as they were termed; and the "proselytes of righteousness," or of the covenant. According to the rabbis the proselytes of the gate were those who renounced idolatry and worshipped the only true God according to the (so-called) seven laws of the children of Noah, without subjecting themselves to circumcision and the other commands of the Mosaic law. The proselytes of righteousness were persons who had been fully converted from paganism to Judaism, had been circumcised, and bound themselves to observe the Mosaic law.

PROSIMIÆ, a name applied to the lemurs and their allies.

PROSODY, that part of grammar which treats of the quantity of syllables, of accent, and of the laws of versification. Though chiefly restricted to versification, it may also be extended to prose composition. In the Greek and Latin languages every syllable had its determinate length or quantity, and verses were constructed by systems of recurring feet, each foot containing a definite number of syllables, possessing a certain quantity and arrangement. The versification of modern European languages, in general, is regulated mainly by accent and number of syllables, though the weight or quantity of syllables has also to be taken into account if harmonious verse is to be produced.

PROTECTION, applied in economics to an artificial advantage conferred by a government or legislature on articles of home production, either by means of bounties or (more commonly) by duties imposed on the same or similar articles introduced from abroad. Such duties may be simply protective, that is, such as that the foreign and home articles can compete in the market on nearly equal terms; or prohibitory, that is, such as to exclude foreign competition altogether. See Free-trade.

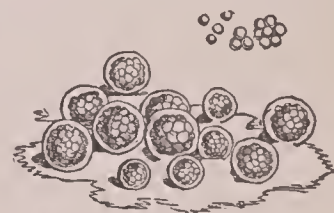
PROTESTANTS, a name given to the party who adhered to Luther during the reformation in 1529, and protested, or made a solemn declaration of dissent

from a decree of the emperor Charles V. and the diet of Spire, and appealed to a general council. The protesting members were the electors John of Saxony and George of Brandenburg, Princes Ernest and Francis of Brunswick-Lüneburg, Philip, landgrave of Hesse, and Wolfgang, prince of Anhalt, together with fourteen imperial cities, the chief of which were Strasburg, Nürnberg, Ulm and Constance. The name is now applied generally to those Christian denominations that differ from the Church of Rome, and that sprang from the reformation. See Reformation.

PROTEUS, in classical mythology, a marine deity who fed the flocks (seals) of Poseidōn (Neptune) in the Ægean Sea. He is represented as a soothsayer who prophesied only when compelled by force and art, and who tried every means to elude those who consulted him, and changed himself, after the manner of the sea gods, into beasts, trees, and even into fire and water.

PROTHONOTARY, a term for certain functionaries connected with the papal court who receive the last wills of cardinals, make informations and proceedings necessary for the canonization of saints, etc.

PROTODUCUS, a genus of algæ (red-snow) appears on the surface of snow, tinging extensive tracts in the Arctic regions or among the Alps, in an incredibly short space of time, with a deep crimson. This plant, which may be



Protococcus nivalls (red-snow), magnified and natural size.

regarded as one of the simplest forms of vegetation, consists of a little bag or membrane forming a cell. A large number of these are commonly found together, but each one is separate from the rest, and is to be regarded as a distinct individual.

PROTOCOL, in diplomacy, a document serving as a preliminary to, or for the opening of, any diplomatic transaction; also, a diplomatic document or minute of proceedings, signed by friendly powers in order to secure certain political ends peacefully.

PROTOPLASM, a substance consisting of carbon, oxygen, nitrogen, and hydrogen, nearly identical with the white of an egg, and constituting the most elementary living matter in animal and plant structures. It is colorless, transparent, and apparently destitute of structure, and is seen in its simplest form in some of the lowest types of animal life, as in the Protozoa. When unrestricted by an imprisoning envelope it is endowed with the power of extending itself in all directions in the form of mutable processes which can be withdrawn spontaneously, and it has also the power of passing or flowing in minute masses through closed membranes without these masses thereby losing their identity of

form. In the form of cells, the skin of which is merely dead and hardened protoplasm, and inclosing a nucleus, or with a nucleus embedded in its substance, it is the structural unit of all organized bodies, constituting not only the basis of the ovum of both plants and animals, but of the tissues themselves in their perfect state, which are mere multiples of such cell-units variously modified. (The nucleus is believed by some to be doubtful, and due to imperfection in the glass.) As the protoplasm in our bodies is continually undergoing waste, a continuous renewal of the material is essential to the continuance of life. Animals, however, cannot elaborate protoplasm from mineral substances for themselves, they being able only to convert by the process of digestion dead protoplasm into living. Plants can, on the other hand, manufacture protoplasm from mineral compounds and the atmosphere, and so they are the storehouse of protoplasmic matter for the animal kingdom. Some biologists prefer the term Bioplasm to that of Protoplasm, as being more expressive of its function. Sarcode is also used similarly.

PROTOZOA, a sub-kingdom including the most lowly organized members of the animal kingdom.

PROUDHON (prô-dôn), Pierre Joseph, a French publicist, born at Besançon 1809, died there 1865. Political economy became his chief study, and in 1840 appeared his famous work, bearing on the title-page the question: *Qu'est-ce quela Propriété?* (What is property?), to which the first page of the treatise contains the answer, "C'est le Vol" (it is theft). Besides those already noticed his more important treatises are: *Discours sur la Célébration du Dimanche*, *De la Création de l'Ordre dans l'Humanité*, *Système des Contradictions Economiques*.

PROVERBS, one of the canonical books of the Old Testament, usually in the main ascribed to Solomon, in accordance with the superscriptions in chap. i. 1; x. 1; xxv. 1, which, if not written by Solomon himself (as the first two of them may have been), at least represent the traditional views of the ancient Jewish church. According to modern Biblical critics the book of Proverbs is composed of several sections written by different authors and at different times, and finally collected into a single book at some period subsequent to the return from the captivity. All seem to be agreed that some part of the book is to be ascribed to Solomon, but there is great diversity of opinion as to how large his share is. With regard to the other two contributors to Proverbs named in the book itself, Agur and Lemuel, nothing whatever is known; and in the case of Lemuel it is even suspected that the name is not that of a real personage. The canonicity of the book of Proverbs is represented as a subject of dispute in the Talmud, some having objected to receive the book as canonical on account of the contradictions it contains. It ultimately found its place, however, in all the Jewish lists of the sacred writings.

PROVIDENCE, one of the capitals of the state of Rhode Island (the other

being Newport), situated on both sides of the Providence or Seekonk, at the head of Narragansett bay, 40 miles s.s.w. of Boston. There are many fine public and private buildings. Of the former the most important are the city-hall, library building, court-house, the buildings of Brown university, etc. The industrial establishments include flour and saw mills, cotton and woolen factories, foundries, steam-engine and boiler factories, machine-shops; printing, bleaching, calendering, and dye works, etc. Providence has a safe and commodious harbor, though somewhat difficult of access, and the coasting trade is important. Pop. 1909, 211,000.

PROVOST-MARSHAL, in the army, is an officer of the rank of a captain, who deals with offenses against discipline, brings the offenders to punishment, and sees the sentence executed. In the navy there is a similar office.

PRUDHON (prü-dôn), Pierre, a French painter, born in 1758, died in 1823. His importance consists in the fact that, in opposition to David, he accentuated the purely pictorial element and the effect of light in his works.

PRUNING, is the severing of portions of the stem, branches, shoots, leaves, or roots of a plant for the purpose of removing excrescent or unprofitable growths, and rendering the sap more conducive to the nutrition of the valuable parts of the plant. The immediate effect of pruning is to reduce the growth of a plant in as far as it depends on the amount of foliage duly exposed to the light; but as by judicious pruning the parts left have not only a greater share of sap, but are better exposed to the light, its ultimate effect is to produce a larger and stronger plant. From the tendency of sap to flow in increased quantity into the parts immediately adjoining those where its flow has been interrupted, an almost unlimited power is given to the gardener of controlling the direction of the growth of a plant. The season for pruning varies with the nature of the tree and the purpose for which it is pruned. In general it may be said that autumn or winter is the best season for extensive pruning; in summer an excess of vigor in the plant may require a little pruning, but in spring it not only weakens the plant but is liable to induce disease. Root-pruning is employed to check rapidity of growth and to induce development of flower-buds. The best season for this operation is after the leaves have fallen in autumn or before the sap begins to flow in spring.

PRUSSIA (German, Preussen), Kingdom of, the leading state of the German empire, comprising the greater part of Northern and Eastern Germany, and part of Western Germany, divided as in the following table:

Provinces	Area—sq. miles	Pop.
East Prussia.....	14,280	1,994,417
West Prussia.....	9,852	1,563,459
Brandenburg.....	15,405	4,992,102
Pomerania.....	11,627	1,634,659
Posen.....	11,182	1,888,055
Silesia.....	15,562	4,668,378
Saxony.....	9,747	2,833,224
Schleswig-Holstein.....	7,295	1,387,587
Hanover.....	14,855	2,590,336
Westphalia.....	7,802	3,188,072
Hesse-Nassau.....	6,089	1,897,310

Rhineland.....	10,422	5,758,995
Hohenzollern.....	441	66,783
Total.....	134,500	34,463,377

The capital and largest town is Berlin. Other large towns are Breslau, Cologne, Frankfort, Hanover, Magdeburg, Düsseldorf, Stettin, Charlottenburg, and Königsberg. The whole of Northern and Eastern Prussia, from Holland on the west to Russia on the east, belongs to the great plain of Northern Europe, and may be described generally as a vast plain, elevated in the south and south-west, and thence descending toward the Baltic and the German ocean. On the shores of the Baltic and North sea, large tracts are only saved from inundation by low sand-hills. Behind these hills extensive lagoons, on the Baltic coast called Haffs, have been formed, communicating with the sea by narrow outlets. The chief bays or gulfs are Danzig bay, Pomeranian bay, and Kiel bay, all on the Baltic coast; and on the Baltic coast are the islands of Rügen, Usedom, Wollin, etc.; in the North sea the North Frisian islands and East Frisian islands. The principal river of Prussia is the Elbe, which enters it from the Kingdom of Saxony, flows northwestward, and enters the North sea between Hanover and Holstein. The Weser and the Ems, are the principal rivers west of the Elbe. Lakes abound in almost every province. The climatic conditions of this extensive territory must necessarily be diversified. The average of a number of places situated between the highest and lowest altitudes gives a mean annual temperature of 52° Fahr.

The south-western division of Prussia, consisting of the greater part of Westphalia, the Rhenish province, and Hesse-Nassau, differs so much from the eastern divisions as, in many respects, to present a striking contrast to it. In particular, its surface as a whole is much more finely diversified. By far the greater part of this portion of the Prussian monarchy belongs to the basin of the Rhine, which, entering it on the south-east, traverses it in a n.n.w. direction till it enters Holland. There are numerous streams tributary to the Rhine, the largest being the Moselle with its tributary the Saar. There are no lakes worth mention in this portion of Prussia. As compared with the division already described, the climate of this part of Prussia is milder in winter and cooler in summer, the mean annual temperature being about 1° higher.

The Rhine valley and the province of Saxony may be considered the most productive portions of the kingdom. Rye is the chief agricultural product, oats are largely grown in the north-east, wheat chiefly in the south and west, while the other grain crops are spelt (an inferior sort of wheat), corn, millet, and barely. Potatoes are extensively cultivated; beet-root for the production of sugar is a very important crop; flax, hemp, and rape-seed cover large areas; tobacco is raised in several provinces; and in the Rhine and Moselle districts the vine is freely cultivated and some of the finest wines produced. In East Prussia horses are reared chiefly for

military purposes; cattle are largely exported from the maritime provinces, and in West Prussia and Pomerania sheep are raised in large numbers. The forests cover about 23 per cent of the total area, and are a great source of wealth, forestry being nowhere better understood than in Prussia. In some of the forests the wild boar is common, other wild animals being the wolf, lynx, wild-cat, etc.

Mining is one of the chief branches of Prussian industry; the most important mineral products being coal and lignite, iron, copper, lead, silver, and zinc, while other minerals produced to a greater or less extent are cobalt, nickel, arsenic, antimony, manganese, rock-salt, kainit and other potash salts, alum, and copperas. The chief textile manufactures are those of linens, cottons, and woollens. Silesia, Brandenburg, and Westphalia, are the provinces in which the linen industry is chiefly developed; the cotton manufacture is most extensive on the Rhine; the woolen manufacture has its chief seats in Brandenburg and the Rhenish province; while silk and velvet are made in the Rhine valley, as also at Berlin. In iron and steel were the chief manufacturing centers are Essen, Solingen, Aix-la-Chapelle, and Burscheid. The manufacture of porcelain and the finer kinds of ware is extensive, and leather and paper making are large industries. Other manufactures of national importance are beet-root sugar, chocolate, chicory, chemical products, and tobacco.

Prussia carries on a large trade both by sea and with its inland neighbors. The principal exports are textile fabrics, yarn, metals and metal wares, agricultural produce and live stock, wool, chemicals, spirits, coal, timber, leather, stoneware and glass, etc.; and the imports are chiefly in the raw materials connected with the textile and other manufactures, and tea, coffee, sugar, and other colonial products. Besides the ordinary road and canal communication, Prussia has an extensive system of railways. The principal ports are Memel, Pillau, Königsberg, Danzig, Stettin, Stralsund, Kiel, and Flensburg on the Baltic; and Altona on the North sea. In some of these ports, and particularly Stettin, shipbuilding is carried on with considerable activity. The system of money, weights, and measures is the same as that of the rest of Germany.

Prussia is a monarchy hereditary in the male line, the present constitution of which was framed by the government with the aid of the constituent assembly, in 1850, and subsequently modified by royal decrees. The king is assisted in the executive by an irresponsible privy-council and by a cabinet which is nominally responsible to a legislative assembly composed of two chambers. The primary qualification of electors is based on taxation, and the primary electors are divided into three classes. Although the reigning family and nearly two-thirds of the total population are Protestant, absolute religious liberty is guaranteed by the constitution. A complete system of primary, secondary, and university education exists, all grades of schools being linked together accord-

ing to a definite scheme or schemes of study. Elementary education is enforced by law, maintained by local taxes, and administered by local authority. Prussia has ten universities—Berlin, Bonn, Breslau, Göttingen, Greifswald, Halle, Kiel, Königsberg, Marburg, and Münster. The historical development of the Prussian kingdom is closely associated with three important elements. The first of these is found in the growing power of the Electorate of Brandenburg, which formed the nucleus of the future kingdom; the second relates to the acquirement of the province of Prussia, which gave its name to the new heterogeneous territory; and the third is associated with the rule of the Hohenzollern family, under whose skilful diplomatic and military guidance the small Brandenburg electorate has grown into what is now considerably the larger portion of the German empire. Brandenburg, which had been conquered by Charlemagne in 789, was erected into a margraviate by Henry I. (the Fowler), emperor of Germany in 926. Albert the Bear, who received Brandenburg as a fief from the Emperor Lothaire (1134), conquered the Slavonian Wends, and took in 1157 the title of Margrave of Brandenburg. Brandenburg later fell as a lapsed fief to the empire, and Louis of Bavaria gave it to his son. Remaining under Bavarian rule for three electorates it was subsequently ceded to the house of Luxemburg, and Charles IV., the first imperial representative of this house, gave it successively to his sons Wenceslaus (1373) and Sigismund (1378). The latter being in debt received from Frederick, the burgrave of Nürnberg, a loan of 400,000 gold florins, for which Frederick held Brandenburg in pawn, and subsequently acquired it in full. This burgrave was the descendant of Conrad of Hohenzollern, a cadet of a Suabian family to whom belonged a small territory surrounding the ancestral castle of Hohenzollern, of which they traced their lordship back to the time of Charlemagne. Frederick II., who succeeded his father in 1440, extended the possessions of his family by policy as well as by valor. In 1470 he abdicated in favor of his brother Albert III., Joachim II., who succeeded in 1535, embraced the Reformation, and established Lutheranism in 1539. In 1537 he acquired the reversion of the principalities of Liegnitz, Brieg, and Wohlau. John George succeeded in 1571. Joachim Frederick, who succeeded in 1598, married his son John Sigismund to the daughter of Frederick Albert, duke of Prussia; and in 1618 John Sigismund united the duchy of Prussia to the electorate, thus bringing it about that the whole country became known as Prussia.

John Sigismund was succeeded in 1619 by his son George William, who was unequal to encounter the terrible crisis that now occurred in the affairs of Germany, the Thirty Years' war. A very different man was his son Frederick William, called the Great Elector, who may be regarded as the virtual founder of the Prussian monarchy. Dying in 1688 he was succeeded by his son Frederick, who in 1701 had himself crowned as king, being the first king of Prussia.

Frederick I. was succeeded by his son (1713) Frederick William I., who governed Prussia till 1740. He went to war with Charles XII., and acquired part of Pomerania, with Stettin, from Sweden. At his death he left a prosperous country, a well-supplied treasury, and an army of 80,000 men to his successor.

Frederick II., surnamed the Great, succeeded to the crown on the death of his father in 1740. In less than a year after his accession he proclaimed war against Maria Theresa in order to enforce his claim to the Silesian principalities, and invaded Silesia. By a treaty concluded at Berlin (1742) Frederick obtained the cession, with the exception of some specified districts, of both upper and lower Silesia, and of Glatz. Conceiving that the Austrians might seek to regain this territory, Frederick in 1744 invaded Bohemia, and commenced what is called the Second Silesian war. He gained such successes, that when peace was concluded in 1745, Austria confirmed the cession of Silesia, which was guaranteed by Great Britain. In the Seven Years' war the immense forces which his enemies were able to bring into the field reduced Frederick to the greatest straits, and gave opportunity for the development of his strategic genius. According to Frederick's calculation 886,000 men had perished in a war which failed in effecting any territorial change; but it transformed Prussia into one of the chief European powers. Frederick determining again to extend his boundaries entered into an alliance with Austria, and invaded the territories of Poland. Negotiations followed with Russia, and in 1772 the partition of Poland was arranged in a treaty between the three powers. In this way Prussia obtained most of Pomerania and a large portion of Poland. Frederick died in 1786, and was succeeded by his nephew Frederick William II.

In 1792, war having already been declared by the French authorities against the empire, the Prussians, under the Duke of Brunswick, invaded France. They were defeated by Kellerman at Valmy, and soon afterwards Frederick William withdrew from this war with France. Then followed a second and a third partition of Poland (1793, 1795), by which Prussia acquired a considerable accession of territory. Frederick William died in 1797, and was succeeded by Frederick William III. In 1804 Prussia recognized Napoleon as Emperor of France, and in the campaign which ended in the overthrow of Austria at Austerlitz (1805) remained neutral. This attitude was at first successful, but ultimately it led to distrust among the German states, and by the formation of the confederation of the Rhine Prussia was isolated and left to the mercy of Napoleon. On the 14th October, 1806, the armies met at Jena and Auerstadt, where the Prussians were completely defeated, and the whole country was soon in the hands of Napoleon, who entered Berlin in triumph. At the Peace of Tilsit (June 1807), concluded between Prussia and Napoleon, all lands between the Rhine and the Elbe were ceded to Napoleon for his free disposal, and a war

PRUSSIAN BLUE

indemnity of 140,000,000 francs was imposed on the mutilated kingdom. In the great struggle for the overthrow of Napoleon, an important part was taken by the Kingdom of Prussia, and the Prussian troops along with the British bore a noble part in the Waterloo struggle. At the Congress of Vienna (1815), when the map of Europe was rearranged, Prussia, was placed in a more advantageous position than before. She now also formed one of the states in the new German confederacy.

After the restoration Frederick William III, leaned to the despotic counsels of Austria and Russia, supported heartily the Holy Alliance, and entered upon a reactionary policy which continued until his death in 1840. He was succeeded by Frederick William IV. The Poles in 1848 revolted against Prussian rule, but the movement was summarily suppressed. In 1857, the king being unable to conduct affairs by reason of mental illness, his brother William became regent, and ultimately succeeded to the throne on the death of Frederick William in 1861.

The new king, William I., showed a disposition to absolutism, which in 1862—63 occasioned a lengthened dispute between the chambers and the ministry under Count Bismarck. Through a disagreement with Austria over Schleswig and Holstein the brief campaign known as the Seven Weeks' war took place (1866), the Prussian forces were armed with the new needle-gun, and the whole movements were directed by the chief of the staff, Count von Moltke. The Austrians, under General Benedek, were completely defeated near Königgrätz in Bohemia, where on 3d July was fought the decisive battle of Sadowa; and peace soon followed. In 1870 Prince Leopold of Hohenzollern consented to become a candidate for the then vacant Spanish throne. This was opposed by the French emperor, who demanded not only that the candidates should withdraw, but that the King of Prussia should pledge himself not to permit any such future candidature. This being refused, war was declared by France on 15th July, 1870, with a most disastrous result to herself. (See Franco-German War.) After the German arms had proved entirely successful, on the invitation of the North German parliament supported by the South German states, the King of Prussia assumed on 18th January, 1871, the title of German emperor.

From this point the history of Prussia is, to a great extent, merged in that of the German empire. In the hands of Prince Bismarck, acting as premier of Prussia as well as chancellor of the empire, a strong, central, autocratic government was maintained. In his policy, both home and foreign, Prince Bismarck was supported by the Emperor William I. until the death of the latter in March, 1888. He was succeeded by his son, Frederick III., who, when he ascended the throne, was struggling with a deadly throat disease. When he died in June 1888 he was succeeded by his son, William II., who has shown himself a ruler with a mind and will of his own.

PRUSSIAN BLUE, a cyanide of iron

possessed of a deep-blue color, and much used as a pigment. It is also used in medicine.

PRUSSIAN BROWN, a color obtained by adding a solution of the yellow prussiate of potash to a solution of sulphate of copper, which throws down a precipitate of deep brown. This, when washed and dried, is equal to madder, and possesses greater permanency.

PRUSSIC ACID, called also hydrocyanic or cyanhydric acid, was discovered by Scheele in 1782, but first prepared in the pure state by Gay-Lussac in 1811. It is a colorless liquid which solidifies at 5° F. to feathery crystals, and boils at 80°. Its specific gravity is about 0.7. It dissolves in all proportions in water, forming a liquid which reddens litmus-paper but slightly. It is found in the kernels of bitter almonds, peaches, apricots, plums, cherries, and quinces; the blossom of peaches, sloes, etc.; the leaves of the beech, cherry, laurel; and various parts of other plants. Pure prussic acid is prepared by passing a stream of dry sulphuretted hydrogen over dry cyanide of mercury. This acid, which is one of the strongest poisons known, is used medicinally to remove various forms of irritation; but in all cases it must be used with extreme caution. When an overdose is administered death is instantaneous, and with a lesser dose the symptoms are convulsions or paralysis. The nature of its action is not clearly understood, but the best antidotes are found to be ammonia, chlorine-water, or a subcutaneous injection of atropine.

PSALMS, Book of, one of the books of the Old Testament, containing the liturgical collection of hymns used by the Jews in the temple service. Each psalm in the collection, with a few exceptions, has a particular superscription, such as *maschil*, *instruction*, *michtam*, *memorial*, etc. The chronology of the psalms is much disputed. The earliest (Psalm xc.) is said to have been written by Moses, many are attributed to David, a few are supposed to have been written on the return from the captivity, and some are assigned to the time of the Maccabees. In structure the psalms have the strophe and anti-strophe which is so characteristic of Hebrew poetry. It would also seem that many of them were meant to be sung in parts, the chief part by the officiating priest, and a responsive part by the people. The book of Psalms as we have it is essentially the hymn-book of the second temple, and according to the latest criticism, was ascribed to David, merely because the order of the worship in the second temple was the same as that prescribed by him for the first temple.

PSALTER, specifically, the version of the Psalms in the Book of Common Prayer; also applied in the Roman Catholic church to a series of devout sentences, 150 in number, and to a large chaplet or rosary with 150 beads, agreeing with the number of the psalms.

PSALTERY, or **PSALTERION**, an instrument of music used by the Hebrews, the form of which is not now known.

PSKOV, or **PLESKOV**, a government of Russia, bounded by those of St. Petersburg, Novgorod, Tver, Smolensk,

PTARMIGAN

Vitebsk, Livonia; area, 17,069 sq. miles. Pop. 948,080.—Pskov, or Pleskov, the capital, is situated on the Velikaia, on which there is regular communication by steamer with Dorpat. Pop. 30,424.

PSORI'ASIS, a kind of skin disease, in which elevated red patches appear covered with large scales, there being often cracks or fissures between, from which blood may ooze. In some cases it is a syphilitic affection. The name is also given to the itch.

PSYCHE (si'kē), a sort of mythical or allegorical personification of the human soul, a beautiful maiden whose charming story is given by the Latin writer Apuleius. She was so beautiful as to be



Cupid (Eros) and Psyche.—Capitoline Museum, Rome.

taken for Venus herself. This goddess, becoming jealous of her rival's charms, ordered Cupid or Love to inspire her with love for some contemptible wretch. But Cupid fell in love with her himself. Many were the trials Psyche underwent, arising partly from her own indiscretion, and partly from the hatred of Venus, with whom, however, a reconciliation was ultimately effected. Psyche by Jupiter's command became immortal, and was forever united with her beloved.

PSYCHICAL RESEARCH (si'ki-kal), Society for, an English society, founded in 1882, "for the purpose of making an organized attempt to investigate that large group of debatable phenomena designated by such terms as mesmeric, psychical, and spiritualistic."

PSYCHOLOGY (si-kol'-) is the science or department of philosophy which



Ptarmigan, winter plumage.

deals with the phenomena of mind. See Mind, Physics, Philosophy.

PTARMIGAN (tār'-), a bird of the grouse family, distinguished from the true grouse by having the toes as well as

the tarsi feathered. The male is about 15 inches long, the female about an inch less. In summer the predominant colors of its plumage are speckled black, brown, or gray, but in winter the male becomes nearly pure white, and the female entirely so. In Britain it is to be met with only on the summits of some of the highest Scottish hills, chiefly amid the Grampians, in the Hebrides and Orkneys, and sometimes but rarely in the lofty hills of Cumberland and Wales. The willow-ptarmigan or willow-grouse occurs in great abundance in the arctic regions of America and in Norway, whence great numbers are brought to the London market.

PTERICHTHYS (te-rik'this), a fossil genus of fishes belonging to the Old Red Sandstone.

PTERODACTYL ("winged-finger"), a genus of extinct flying reptiles of the order Pterosauria, found in the Juralimestone formation, in the Lias at Lyme-



Pterodactyl.

Regis, in the Oolite slate of Stonefield, etc. The pterodactyls had a moderately long neck, and a large head; the jaws armed with equal and pointed teeth; most of the bones, like those of birds, were "pneumatic," that is, hollow and filled with air; but the chief character consisted in the excessive elongation of the outer digit (or little finger) of the forefoot, which served to support a flying membrane. A number of species have been discovered, most of them small or of moderate size, but one must have had an expanse of wing of at least 20 feet.

PTHAH, or **PHTHA**, an ancient Egyptian divinity, the creator of all things and source of life, and as such father and sovereign of the gods. He was worshipped chiefly at Memphis under the figure of a mummy-shaped male, and also as a pygmy god.

PTOLEMAIC SYSTEM, in astronomy, that maintained by Claudius Ptolemy, the astronomer, who supposed the earth to be fixed in the center of the universe, and that the sun and stars revolved around it. This long-received theory was rejected for the Copernican system.

PTOLEMY (Ptolemaios), the name of a line of Græco-Egyptian kings, who succeeded, on the division of the empire of Alexander the Great, to the portion of his dominions of which Egypt was the head. Ptolemy I., called Soter, the Savior, was by birth a Macedonian. Ptolemy was one of the intimate friends of Alexander, attended the king on his

expedition to Asia, was admitted into the bodyguard, and in 329 B.C. commanded one of the chief divisions of the army. On the death of Alexander he attached himself to the party of Perdiccas, and secured for himself the government of Egypt. He married Eurydice, daughter of Antipater, and in B.C. 320 he seized the satrapy of Phœnicia and Cœle-Syria. In 308 he invaded Greece, and proclaimed himself as a liberator. Ptolemy died in B.C. 283.—Ptolemy II. (Philadelphus), born B.C. 309, succeeded his father, and reigned in almost complete peace. His chief care as ruler was directed to the internal administration of his kingdom. He spared no pains to fill the library of Alexandria with all the treasures of ancient literature, and among the architectural works erected during his reign were the lighthouse on the island of Pharos, the Alexandrian museum, and the royal burying-place.—Ptolemy III., surnamed Euergetes ("benefactor"). He was early engaged in an important war against Syria, which having invaded he advanced without opposition to Antioch, then turned eastward, subduing Mesopotamia, Babylonia, etc. He died in B.C. 222, being succeeded by Ptolemy IV., surnamed Philopator. His Syrian possessions having been gradually wrested from him by Antiochus the Great, Ptolemy put himself at the head of a large army and completely defeated Antiochus at Raphia, in B.C. 217.—Ptolemy V. (surnamed Epihpānes), his son and successor, was under five years old at his father's death, and this led Philip of Macedon and Antiochus III. (the Great) of Syria to combine to dispossess Ptolemy, and divide his dominions. To avert this danger the guardians of the young king placed him under the protection of Rome, which thus had first an occasion for interfering in the affairs of Egypt. Ptolemy was poisoned



Ptolemy I.—Antique gem.

B.C. 181.—Ptolemy VI. (surnamed Philomētor) was a child at the death of his father. His reign was much disturbed by the rivalry of a brother, and being expelled from Alexandria he repaired to Rome B.C. 164, by whose intervention he was replaced. He died in B.C. 146.—Ptolemy XI. ("flute-player") was driven from his kingdom by his subjects, who were ground down by taxation; but he was restored by the Romans (to whom he gave great sums of money), and died B.C. 51.—Ptolemy XII., son of the preceding, reigned jointly with his sister Cleopatra till B.C. 48, when Cleopatra

was expelled, and raising an army in Syria invaded Egypt. On the arrival of Cæsar, Cleopatra by her charms acquired an ascendancy over him. Ptolemy put himself at the head of the insurgents, was defeated by Cæsar, and drowned in attempting to make his escape, in B.C. 48 or 47.—Ptolemy XIII. (Aulētēs), the youngest son of Ptolemy XI., was declared king by Cæsar in conjunction with his sister Cleopatra in B.C. 47. He was married to his sister, but being only a boy possessed no more than the name of husband or king. Cleopatra caused him to be put to death, and the line of the Ptolemies ended when Cleopatra perished by her own hands after Octavius defeated Antony at Actium, and Egypt become a Roman province, B.C. 30.

PTOMAINES (tō'ma-in), one of a class of alkaloids or organic bases, which are generated as a result of putrefaction, during morbid conditions prior to death, and even, it is said, during normal healthy conditions of life. Some of them are highly poisonous, and in their action may even resemble strychnine.

PUBERTY, the period in both male and female marked by the functional development of the generative system. In males it usually takes place between the ages of thirteen and sixteen; in females somewhat earlier; and, as a rule, in very warm climates puberty is reached somewhat sooner than elsewhere. In males puberty is marked externally by the deepening of the voice, the first appearance of the beard, greater firmness, fullness of body, etc.; in females, by the enlargement of the breasts, and by the general rounding out of the frame, and most unequivocally of all by the commencement of menstruation.

PUBLIC SCHOOLS, the schools, especially the elementary schools, established under any national system of education; but in England the term is often specifically applied to certain important secondary schools or colleges, including Eton, Harrow, Winchester, Rugby, Westminster, St. Paul's, Shrewsbury, etc., known as "the great public schools of England."

In the United States the term is applied to the institutions maintained at public expense for the formal education of children. The idea of organizing schools where rich and poor might obtain efficient free instruction did not take firm root in the minds of the people of the several states until the early part of the 19th century. The federal government has by means of land grants and other aid encouraged the several states in the establishment of school systems.

The three main types of public schools in the United States are: (1) the city elementary and high schools; (2) the town union school, which includes a high school department; (3) the district school, so called from its usually being established in certain rural districts, and offering elementary instruction.

PUCK, a celebrated elf, the "merry wanderer of the night," whose character and attributes are depicted in Shakespeare's *Midsummer Night's Dream*, and who was also known by the names of Robin Goodfellow and Friar Rush. He was the chief of the domestic fairies,

PUDDING-STONE

and many stories are told of his nocturnal exploits.

PUDDING-STONE, or **PLUM-PUDDING STONE**, a term now considered synonymous with conglomerate, but originally applied to a mass of flint pebbles cemented by a siliceous paste. When select specimens are cut and polished they resemble a section of a plum-pudding, and are used for ornamental purposes.

PUEB'LA, in full La Puebla de los Angeles, the capital of a Mexican state of the same name, situated on a plateau 76 miles s.e. of Mexico. It has spacious streets and solidly-built houses, the cathedral being a magnificent structure. It contains a large number of religious edifices, many of them highly decorated. There are also several colleges, a museum and a theater. It is one of the chief seats of Mexican manufacturing industry, and its chief products are cotton and woolen goods, leather, glass, earthenware, and soap. Puebla was built by the Spaniards in 1533-34. Pop. 93,521. The state consists of an elevated plateau, and contains much fertile soil. On the western frontier is the volcano of Popocatepetl, the highest mountain in Mexico. Area, 12,042 sq. miles; pop. 1,021,133.

PUEBLO, the second largest city and county-seat of Pueblo co., Colorado. Its transportation facilities comprise the Denver and Rio Grande, the Atchison, Topeka and Santa Fé, the Missouri Pacific, the Chicago, Rock Island and Pacific, and the Colorado and Southern. Pueblo is the great distributing and receiving point for this section of vast natural wealth. It has become known as the "Pittsburg of the West," being famous for its iron and steel, and smelting industries. Pop. 33,267.

PUEBLO INDIANS are semi-civilized Indians of New Mexico and Arizona, some 9,000 in number, living in villages in communal houses (a number of families together), and possessed of considerable skill in agriculture and the simpler kinds of manufacture. The village communities are self-governed, and they are only nominally citizens of the United States.

PUER'PERAL FEVER, a dangerous contagious disease peculiar to women in childbed, and due to the absorption of poisonous material by the raw surface of the womb. The poison may originate from decomposing material in the womb itself, but is generally introduced from without.

PUFF-ADDER, a serpent found in South and Central Africa. Its popular name is derived from its power of puffing out the upper part of the neck when irritated or alarmed. It is very thick, attains a length of 4 or 5 feet, and is extremely venomous. The Bosjesmen poison their arrows with its venom.

PUFF-BALLS, a species of birds so called from their globular shape, and because if they are struck when ripe the dry spores fly out in powder like a puff of smoke, from a genus of fungi. When young, and whether raw or cooked, some of them are very good eating.

PUFFIN, the name for the marine diving birds. The common puffin is a native of the arctic and northern temperate regions, and is often met with on

the rocky cliffs of Great Britain and Ireland. It is about a foot in length, and from the singular shape and enormous size of its bill, which is striped with



Puff-bird.

orange upon bluish-gray, is often called the sea-parrot or the coulter-neb. Their plumage is glossy black, with the exception of the cheeks and under-surfaces which are white. It breeds upon rocks and in the rabbit-warrens near the sea,



Common Puffin.

and lays one egg, which is white. It lives on fish, crustacea, and insects, and is a gregarious and migratory bird.

PUGET SOUND (pū'jet), an inlet on the northwest coast of the state of Washington, forming the southwest continuation of Juan de Fuca strait, with which it is connected by Admiralty inlet. On its shores are Seattle, Olympia, and other important cities.

PUGILISM. See Boxing.

PULASKI (pōolās'kē), Casimir, Polish soldier in the American revolution, was born in Podolia, Poland, in 1748. He joined enthusiastically in the movement to liberate his country, and fought heroically in the unequal struggle against



Pulaski.

the Russians. He was accused, unjustly it appears, of complicity in the plot to abduct King Stanislas Poniatowski from Warsaw (1771), and in consequence was outlawed and deprived of his estates.

PULLEY

He was induced by Franklin and the French ministry to assist the Americans against England. He arrived in Philadelphia in 1777. In 1778, with the sanction of congress, he organized an independent corps of cavalry and light infantry, called Pulaski's Legion. In 1779 he commanded the French and American cavalry at the siege of Savannah, and during the attack of October 9th was mortally wounded, dying two days later on board the United States brig Wasp.

PULITZER, Joseph, American journalist, was born at Budapest, Hungary, in 1847. He came to the United States in 1864. After serving in a federal cavalry regiment in 1864-5 he became a reporter on Carl Schurz's Westliche Post, St. Louis, later becoming managing editor with a proprietary interest. In 1869 he was elected to the state legislature. In 1878 he purchased the St. Louis Dispatch and combined it with the Evening Post, which as the Post-Dispatch became an important journal of the west. In 1883 he purchased the New York World which, under his management obtained an immense circulation. In 1884 he was elected to the United States congress from New York. He has made donations to educational and charitable causes, and in 1903 provided an endowment fund for a school of journalism at Columbia university.

PULLEY, a small wheel movable about an axle, and having a groove cut in its circumference over which a cord passes. The axle is supported by a kind of case or box called the block, which may either be movable or fixed to a firm support. The pulley is one of the six simple machines or mechanical powers and is used for raising weights. A single

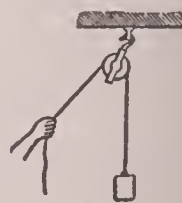


Fig. 1.



Fig. 2.

pulley serves merely to change the direction of motion, but several of them may be combined in various ways, by which a mechanical advantage or purchase is gained, greater or less, according to their number and the mode of combination. The advantage gained by any combination or system of pulleys is readily computed by comparing the velocity of the weight raised with that of the moving power, according to the principle of virtual velocities. The friction, however, in the pulley is great, particularly when many of them are combined together. A pulley is said to be fixed when the block in which it turns is fixed, and it is said to be movable when the block is movable. In the single fixed pulley (fig. 1) there is no mechanical advantage, the power and weight being equal. It may be considered as a lever of the first kind with equal arms. In the single movable pulley (fig. 2) where the cords are parallel there is a mechanical advantage, there being an equilibrium when the power is to the weight as 1 to 2.

It may be considered as a lever of the second kind, in which the distance of the power from the fulcrum is double that of the weight from the fulcrum. In a system of pulleys (fig. 3, 4) in which the same string passes round any number of pulleys, and the parts of it between the pulleys are parallel, there is an

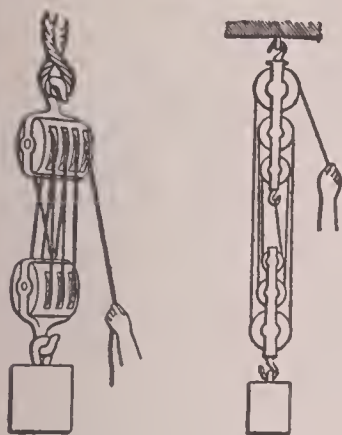


Fig. 3

Fig. 4

equilibrium when the power is to the weight as 1 to the number of strings at the lower block. In a system in which each pulley hangs by a separate cord and the strings are parallel (fig. 5), there is an equilibrium when the power is to the weight as 1 to that power of 2 whose index is the number of movable pulleys (in the case here illustrated $1:2^3$ or $1:8$). Whatever be the mechanical arrangement of the pulleys and of the ropes the



Fig. 5

principle of all pulleys is the same, namely, the transmission of the tension of a rope without sensible diminution so as to obviate the loss of force consequent on rigidity. The term pulley is used indifferently to denote either a single sheave or the complete block and its sheaves. In machinery, a pulley is a wheel, generally with a nearly flat face, which being placed upon a shaft transmits power to or from the different parts of the machinery, or changes the direction of motion by means of a belt or band which runs over it.

PULLMAN, an industrial town now forming a part of Chicago. It was founded in 1880 by George M. Pullman, who established here the extensive shops of the Pullman Palace Car Company. The idea of the promotor was to secure for his employees all the advantages which might accrue from congenial surroundings. The high rates charged for rent, water, and gas, however, caused dissatisfaction among the residents, and in 1889 they voted in favor of annexation to Chicago.

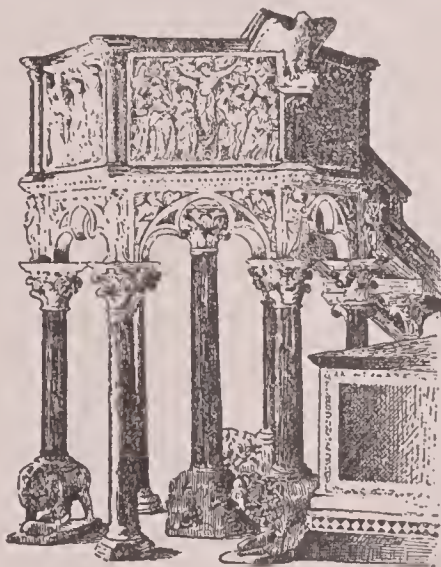
Population, at that time, about 12,000.

PULLMAN, George Mortimer, an American inventor, born in 1831 in Chautauqua co., N. Y. In 1859 he removed to Chicago, and in the same year he remodeled two old coaches into sleeping cars. Four years later he built the first new sleeping car, "Pioneer," upon lines of the now famous "Pullman" cars. In 1867 he organized the Pullman Palace Car company, and was its president until his death, in 1897.

PULLMAN-CAR, a luxuriously fitted up railway carriage, named after its inventor, for the use of which an extra charge is made, and which is specially adapted for sleeping in, or as a drawing room or dining car.

PULMONARY CONSUMPTION. See Consumption.

PULPIT, the elevated inclosure or desk in a church from which the preacher delivers his discourse. The pulpitum



Pulpit of Niccolò Pisano, in the Baptistery at Pisa, Italy.

of the ancient Roman theatres was that part of the stage where the actors performed.

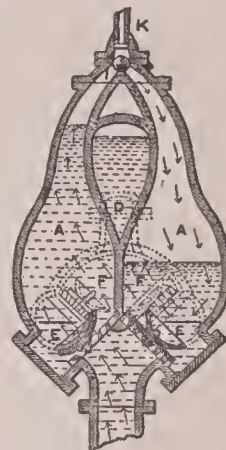
PULQUE (pül'kā), or Octli, a favorite drink in Mexico and Central America, made from the juice of various species of agave, pleasant and harmless until after protracted fermentation, when it becomes an intoxicant. A kind of brandy is also distilled from it.

PULSE, leguminous plants or their seeds, including all kinds of beans, peas, lentils, etc. The considerable proportion of nitrogen which they contain makes them very nutritious, and on that account they are much eaten, with or without rice, in India, where the chick-pea (*Cicer arietinum*) is one of these very largely used. The Hebrew word translated pulse in the authorized version of the Bible, Daniel i. 12, 16, probably means edible seeds in general.

PULSE, the throbbing movement of the walls of blood-vessels, from the passing waves of blood due to the beats of the heart. It is limited in healthy conditions to the arteries. In the newly-born child the healthy pulse registers 130 to 140 beats a minute; at two years of age, 105, at ten years about 90, at

fifteen to twenty about 70; while in old age it may sink to about 60. In females it is somewhat higher than in males, and during certain fevers it sometimes reaches 140 beats per minute. In arteries which lie immediately under the skin it can be felt with the finger, as is the case with the radial artery, the pulsation of which is very perceptible at the wrist. The state of the pulse is therefore an indication of the force and frequency of the action of the heart, and of the fulness of the vessels.

PULSOMETER, an instrument of the pump kind for raising water, especially when that liquid is mixed with solid matter. It acts by the condensation of waste steam sent into a reservoir, the water rushing up into the vacuum formed by the condensation. From the accompanying figure it will be seen that it con-



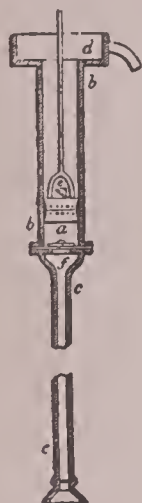
Pulsometer.

sists essentially of a double chamber, or two connected chambers, aa, having a ball-valve i at top (which shuts either chamber alternately) and clack-valves ee at bottom. Steam is admitted at k to one of the chambers and presses out the water contained there through f to the pipe d to be carried away. Condensation then taking place a vacuum is formed, and the ball falls over and closes the opening through which the steam entered, and water flows up through the clack-valves and again fills the chamber. The steam in the meantime is now acting upon the water in the adjoining chamber, condensation then taking place there, the ball falls back to that side, and the operations go on alternately, the result being a steady stream of water sucked into one chamber after another, and then forced out and upward by the steam.

PU'MICE, a substance frequently ejected from volcanoes, of various colors, gray, white, reddish-brown or black; hard, rough, and porous; specifically lighter than water, and resembling the slag produced in an iron furnace. Pumice is really a loose, spongy, froth-like lava. It contains 75 parts silica and 17 alumina with some iron, lime, soda, etc., and the pores being generally in parallel rows, it seems to have a fibrous structure. Pumice is of three kinds, glassy, common, and porphyritic. It is used for polishing ivory, wood, marble, metals, glass, etc.; also for smoothing the surfaces of skins and parchment.

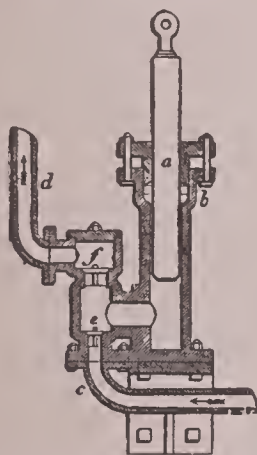
PUMP, a contrivance for raising

liquids or for removing gases from vessels. The air-pump is dealt with in a separate article. Though the forms under which the hydraulic pump is constructed, and the mode in which the power is applied, may be modified in a great variety of ways, there are only four which can be considered as differing from each other in principle. These are the sucking or suction pump, the lift-pump, the force-pump, and the rotary or centrifugal pump. Of these the suction or common household pump is most in use, and for ordinary purposes the



Suction-pump.

most convenient. The usual form and construction of this pump are shown in the annexed engraving. A piston *a* is fitted to work air-tight within a hollow cylinder or barrel *bb*; it is moved up and down by a handle connected with the piston-rod, and is provided with a valve *e* opening upwards. At the bottom of the barrel is another valve *f*, also opening upward, and which covers the



Force-pump of steam-engine

orifice of a tube *cc*, called the suction-tube, fixed to the bottom of the barrel, and reaching to the bottom of the well from which the water is to be raised. When the piston is drawn up from the bottom of the barrel the air below is rarefied, and the pressure of the external air acting on the surface of the water in the well, causes the water to rise in the suction-tube until the equilibrium is restored. After a few strokes the water will get into the barrel, the air below the piston having escaped through

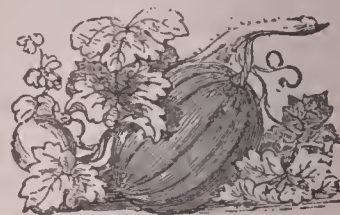
the piston-valve *c*. By continuing, the water will get above the piston and be raised along with it to the cistern *d*, at the top of the barrel, where it is discharged by a spout. The lift-pump has also two valves and a piston, both opening upward; but the valve in the cylinder instead of being placed at the bottom of the cylinder is placed in the body of it, and at the height where the water is intended to be delivered. The bottom of the pump is thrust into the well a considerable way, and the piston being supposed to be at the bottom, as its valve opens upward there will be no obstruction to the water rising in the cylinder to its height in the well. When the piston is drawn up its valve will shut, and the water in the cylinder will be lifted up; the valve in the barrel will be opened, and the water will pass through it and cannot return as the valve opens upward;—another stroke of the piston repeats the same process, and in this way the water is raised from the well; but the height to which it may be raised is not in this as in the suction-pump limited to 32 or 33 feet. The force-pump differs from both of these in having its piston solid, or without a valve and also in having a side pipe with a valve opening outward, through which the water is forced to any height required, or against any pressure that may oppose it. In such pumps the plunger or solid piston is frequently employed instead of the ordinary piston; this arrangement is represented in the accompanying figure, which shows a section of the feed-pump of a steam-engine. The plunger *a* works air-tight through a stuffing-box *b* at the top of the barrel, and on being raised produces a vacuum in the pump-barrel into which the water rushes by the pipe *c* and is discharged, on the descent of the plunger through the pipe *d*, the valves *e* and *f* serving to intercept the return of the water at each stroke. The side pipe *d*, however, requires the addition of an air-vessel. "Double-acting" pumps are often employed for household purposes. (See Fire-engine.) Centrifugal pumps are universally employed wherever the lift is not too great, and the quantity of water is considerable. A wheel, shaped like an ordinary fan, has passages leading from its center to its circumference; it is made to rotate very rapidly in a casing. Its circumference communicates with a delivery pipe, and its center with a pipe leading to the water which is to be pumped. The rapid revolution of the wheel causes by centrifugal action a constant flow of water from center to circumference of the wheel; and in this way the water is sucked up to the center of the wheel, and leaves the circumference by the eduction pipe.

PUMPERNICKEL, a coarse brown bread made in Westphalia from unbolted rye.

PUMPKIN, a climbing plant and its fruit. The pumpkin is originally from India, but is at present cultivated in most parts of Europe, and in America. The fruit is red, and sometimes acquires a diameter of 2 feet. There are two varieties of the plant, one with roundish, the other with oblong fruit.

The fruit is eaten in a cooked state.

PUNCH (contracted from punchinello) the chief character in a popular comic exhibition performed by puppets, who strangles his child, beats to death Judy his wife, belabors a police-officer, etc. The puppet-show of Punch seems to have been first popular in England dur-



Pumpkin.

ing the reign of Queen Anne. The hero was sometimes called Punchinello, a semi-anglicized form of the Neapolitan Pulcinello.

PUNCH, a beverage; received its name from the Hindu word panch, five, this being the number of its ingredients, arrack, tea, sugar, water, and lime-juice. In a common brew of the beverage its ingredients are rum, brandy, sugar, boiling-water, and lemon-juice.

PUNCH, a tool worked by pressure or percussion, employed for making apertures, in cutting out shapes from sheets or plates of various materials in impressing dies, etc. Punches are usually made of steel, and are variously shaped at one end for different uses. They are solid for stamping dies, etc., or for perforating holes in metallic plates, and hollow and sharp-edged for cutting out blanks, as for buttons, steel-pens, jewelry, and the like.

PUNCHEON, a liquid measure of capacity containing from 84 to 120 gallons.

PUNCTUATION, the art of employing signs by which the parts of a writing or discourse are connected or separated as the sense requires, and the elevation, depression, or suspension of the voice indicated. Punctuation serves both to render the meaning intelligible, and to aid the oral delivery. Our present system of punctuation came very gradually into use after the invention of printing, the Venetian printers, the Manutii contributing materially to its development. The principal points used in English composition are the comma (,), semi-colon (;), colon (:), period or full stop (.), note of interrogation (?), note of exclamation or admiration (!), dash (—), and parenthesis (). The comma marks the smallest grammatical division in a sentence, separating the several members of a series, and the subordinate clauses from the main clause. The semi-colon indicates a longer pause than the comma, but requires another member or members to complete the sense. The colon denotes a still longer pause, and may be inserted when a member of a sentence is complete in itself, but is followed by some additional illustration of the subject. The period indicates the end of a sentence, and is also used after contracted words, headings, titles of books, etc., and generally after Roman numerals. The note of interrogation is placed at the end of a direct interroga-

tory sentence. The note of exclamation or admiration is placed at the end of such words or clauses as indicate surprise or other emotion. The dash is employed where a sentence breaks off abruptly, and the subject is changed; where the sense is suspended, and is continued after a short interruption; after a series of clauses leading to an important conclusion; and in certain cases to indicate an ellipsis. The parenthesis incloses a word or phrase introduced into the body of a sentence, with which it has no grammatical connection.

PUNISHMENT, a penalty inflicted on a person for a crime or offense, by the authority to which the offender is subject; a penalty imposed in the enforcement or application of law. The punishments for criminal offenses now known to the English law, are death by hanging, penal servitude, imprisonment with and without hard labor, solitary confinement, detention in a reformatory school, subjection to police-supervision, and putting under recognizance.

In the United States, while there are but few agencies for the assistance of discharged prisoners, considerable care is devoted to the treatment and checking of juvenile crime. Reformatories have existed since 1825, when the first was established on Randall's Island within the limits of the city of New York. There are also a number of semi-public schools. The percentage of youths reformed and trained into good citizens has been placed as high as 60, 75, even 80 per cent. Parents may in some states contribute to the support of their children in reformatories, but as a rule the inmates are orphans or abandoned children or those whose parents are very poor. The best system for training and caring for juvenile offenders probably is that which obtains in Massachusetts.

PUNJAB, or **PANJAB** (the name means "Five Rivers"), a province of British India, under the administration of a lieutenant-governor, so called because it was the region intersected by the five tributaries of the Indus, the Sutlej, the Beas, the Ravi, the Chenab, and the Jhelum. The present lieutenant-governorship of the Punjab, however, is larger than the Punjab proper, and is bounded on the west by Afghanistan and Beluchistan; on the north by Kashmir; on the east by the United (N.W.) provinces; and on the south by Sind and Rajputana. The area, exclusive of the connected native states, is 97,209 sq. miles; the pop., according to the census of 1901, 20,330,339; inclusive of native states, the area is 133,741 sq. miles, and the pop. 24,754,737. The Punjab has had a rather eventful history from the time of Alexander the Great downward. After being long held by rulers of Afghan or Tartar origin, the Sikhs under Runjit Singh established themselves here early in the 19th century. Latterly the country fell into a very distracted state; its Sikh rulers came into warlike contact with the British, and after the second Sikh war in 1849, the country was brought under British administration.

PUNNAH, native state of India, in Bundelcund, by the British agency of

which it is politically superintended, formerly very prosperous from the yield of its diamond mines. Estimated area, 2568 sq. miles; pop. 239,333.—Punnah is the chief town. Pop. 14,676.

PUNT, an oblong flat-bottomed boat used for fishing and shooting in shallow waters. The most common mode of propulsion is by pushing with a pole against the bottom of the river, etc., a process which is hence called punting.

PURDUE UNIVERSITY, a coeducational state institution of higher learning, established in 1869 at Lafayette, Ind., and named for John Purdue, an early benefactor. The university is the Indiana Institute of Technology and embraces six schools: Mechanical engineering, civil engineering, electrical engineering, agriculture, science, and pharmacy. Students in each of the schools are required to spend an average of three hours a day in laboratory, shop, or field. It confers the degrees of bachelor of science and graduate in pharmacy in course, and the following degrees for advanced work: Master of science, mechanical, electrical, and civil engineer, and analytical chemist.

PURGATIVES, are medicines used for the purpose of producing the evacuation of the bowels. The following is a common classification of them: (1) Laxatives or mild cathartics, employed when the least possible irritation is desired, such as manna, sulphur, cassia, castor-oil, tamarinds, prunes, honey, ripe fruit. (2) Saline or cooling laxatives, giving rise to more watery evacuations than the first group, such as Epsom salts, Glauber's salt, phosphate of soda, Scidlitz powders, etc. (3) Active cathartics, occasionally acrid, frequently tonic and stomachic, such as rheubarb, senna (often in the form of black draught), and aloes. (4) Drastic or violent cathartics, such as jalap, scammony, gamboge, croton-oil, colocynth, and elaterium, which in large doses act as irritant poisons, and are employed in smaller doses chiefly when the bowels have failed to be moved by milder purgatives. (5) Mercurial purgatives, such as calomel blue pill, and gray powder. Of late years podophyllin, a preparation of the resin of the May-apple, has come much into vogue as a substitute for mercury in its various forms. All the members of this group are usually combined with or followed by other purgatives, blue pill, for instance, being followed by black draught, and podophyllin combined with taraxacum.

PURGATORY, as believed in by the Roman Catholic church, is an intermediate state after death in which the souls of the righteous expiate, through temporary suffering, sins committed in this life, and not fully atoned for before death. According to the council of Trent, they are "assisted by the suffrages of the faithful, but especially by the most acceptable sacrifice of the mass," to be enabled to enjoy the happiness of heaven. Catholics claim that this belief in purgatory is upheld by the general teaching of Scripture without being specifically declared in any particular passage; they also claim that it is in harmony with the faith and practice of the early Christian ages.

PURIM, a Jewish festival observed on the 14th and 15th of Adar (March), instituted to commemorate the preservation of the Jews in Persia from the destruction threatened them by the schemes of Haman (Esther ix).

PURITANS, a name first applied to those English Protestants who regarded the reformation in England as incomplete, and the Anglican church, even of Edward VI., as retaining too much of the discipline, ritual, and ceremonial of the Church of Rome. Many of them, who were driven into exile under Queen Mary, and who returned to England after the accession of Elizabeth, brought back a zealous desire to remodel the Church of England in the spirit of continental Protestantism, especially that of Geneva. In 1572 a presbytery was set up at Wandsworth in Surrey, and before many years Presbyterianism found adherents both among the clergy and the laity. Meanwhile the Brownists, the Independents of later days, whose Congregationalism was as much opposed to Presbyterianism as to Episcopacy, began to be organized and to make some progress. In doctrine these two Puritan parties differed little from each other, or from many Anglicans who remained contented with the Church of England as it was. The hopes with which the accession of James I. inspired the Puritan party in the church were grievously disappointed when their moderate demands for a reform of ritual and a slight modification of episcopal authority were rejected at the Hampton Court conference. During his reign the prelates and many of the clergy became less Protestant, while the Puritan element in the church, and out of it, increased in intensity. Nonconformity was pursued by new penal statutes, and numbers of Puritans emigrated to New England. This emigration continued during the reign of Charles I. and the ascendancy of Laud. With the downfall of the Anglican system Independency again reared its head in England. The Independents now combined with their congregationalism the desire for a theological latitude, which widened the gulf between them and the Presbyterians. The army became leavened with Independency, and Oliver Cromwell its champion. With his ascendancy the influence of Presbyterianism as a power in the state dwindled, and Independency became the dominant element in English Puritanism. After the restoration of Charles II. and of the old Anglicanism, the Presbyterians, Independents, and Baptists were the three chief denominations into which Puritanism had split up. Since then Nonconformists or Dissenters has been the term generally used where Puritanism would formerly have been employed.

PURNIAH, the northeastern district of the Bhágalpur division of the lieutenant-governorship of Bengal. Rice and indigo are its chief products. Area, 4956 sq. miles; pop. 1,944,658. Purniah, the chief town, stands on the east bank of the Saurá river. It is an unhealthy place, but does a considerable trade in jute. Pop. 14,600.

PURPLE, a secondary color compounded by the union of the primaries

blue and red. Of all the various kinds in use, the Tyrian dye was anciently the most celebrated. This color was produced from an animal juice found in a shell-fish called murex by the ancients; and as it was thus obtained only in small quantities, its use was restricted to the great and wealthy. It became the distinctive color of imperialism, and the later emperors of the East forbade its use by subjects. Hence their offspring were called purphyrogeniti, born in the purple. In modern times, and from the red or scarlet hat, cassock, and stockings worn by them, cardinals are sometimes said to have obtained the purple. With the general disuse of the purple obtained from shell-fish, archil and cudbear, yielded by various species of lichens, were employed in the dyeing of silk and wool; but they have been superseded by the purples obtained from aniline. For cotton the chief purple dye was furnished by madder, but the alizarin to which madder owed its dyeing properties is now prepared from coal-tar. The common shades of purple with which wool is dyed are obtained from logwood with a mordant of alum and tartar.

PURSE-CRAB, a name for decapod crustaceans allied to the hermit-crabs. A species, the robber-crab, found in the Mauritius and the more eastern islands of the Indian ocean, is one of the largest crustaceans, being sometimes 2 to 3 feet in length.

PUS, the white or yellowish matter found in abscesses, and formed upon the surfaces of what are termed healthy sores.

PU'SEY, Edward Bouverie, D. D., after whom the Tractarian movement in the Church of England became designated Puseyism, was born in 1800. In 1833 the Tracts for the Times began to appear, but he was not prominently connected with the Tractarian movement until 1835-36, when he contributed



Rev. Dr. Pusey.

to the Tracts one on baptism, which excited much attention. He died in 1882. Among the more substantial of his works, in addition to his Library of English Fathers and Anglo-Catholic Library, are his Councils of the Church, from the Council of Jerusalem, A.D. 51, to the Council of Constantinople, A.D. 381 (1857); Daniel the Prophet, nine lectures (1864); and the Minor Prophets, with a commentary and introduction to the several books (1860-67).

PUSHKAR, town of India, in Ajmere-Merwára, Rajputána, the only one in India containing a temple dedicated to Brahma. A great fair in October and November is attended by about 100,000 pilgrims. Pop. 5000.

PUSHKIN, Alexander Sergéyevitch, a famous Russian poet, born at St. Petersburg, 1799, died 1837. His works have been translated into German, French, and English.

PUTNAM, Israel, American soldier, was born in Old Salem village (now Danvers), Mass., in 1718. In August, 1755, during the French and Indian war, he was commissioned lieutenant by the Connecticut legislature, later in the year became one of Roger's Rangers, in March, 1756, became captain, saved Fort Edward from being destroyed by fire in the winter of 1757, and in March,



Israel Putnam.

1758, became major. In 1775, hearing of the battle of Lexington, he left his plow in the field, and rode to Cambridge in one day, a distance of sixty-eight miles. Returning, he was made brigadier-general by the legislature, organized and drilled a regiment. In 1775 he received his commission from congress as major-general. On the evacuation of Boston in the spring of 1776, Putnam was placed in command of New York. In 1779, one of his outposts, guarded by 150 men and two cannon, was attacked by the British officer Tryon, with 1500 men. Putnam, being closely pursued while on his way with his men to a swamp, is said to have dashed down a steep hill and escaped. Riding to Stamford and collecting the militia, he formed a junction with his troops, pursued Tryon in his retreat, and took 50 prisoners. In the summer of 1779 he had command of the troops in the Highlands, and completed the fortifications at West Point. The army going into winter quarters, he returned home, and on starting out again for camp was stricken with paralysis, from which he never completely recovered. He died May 19, 1790.

PUTNAM, Rufus, American soldier, was born in Sutton, Mass., in 1738. He enlisted as a private soldier for service in the French and Indian war in 1757. He entered the continental army as lieutenant-colonel in May, 1775, and in August, 1776, was appointed chief engineer of the army with the rank of colonel. He was given command of a Massachusetts regiment in November, and in 1777 served in the campaign against Burgoyne. He was a member for several terms of the Massachusetts legislature, and during Shay's rebellion was General Lincoln's aide. He was one of the judges of the United States court in the northwest territory from 1790

to 1796, concluded an important treaty with the Indians at Vincennes, Ind., in 1792. In 1812 he organized the first Bible society west of the Alleghanies. He died in 1824.

PUTNEY, a suburb of London, in the county of Surrey, on the right bank of the Thames opposite Fulham, and within the parliamentary bounds of Wandsworth. The town is about 8 miles above London Bridge by river, and 4½ miles from Hyde Park Corner by road. The headquarters of the English rowing world are at Putney. Pop. 24,139.

PUTREFACTION, such a decomposition of dead organic matter as is generally accompanied by the evolution of fetid gases, now regarded as due to the agency of bacteria or other organisms floating in the atmosphere, which find a nidus in the putrescible matter and grow and multiply in it. The substances in which these animalcules are thus developed are reduced either to much more simple compounds, or to their original separate elements. The putrefaction, or putrefactive fermentation, of animal substances is usually attended by more fetid and noxious exhalations than those arising from vegetable products, chiefly through the more abundant presence of nitrogen in the former. The formation of ammonia, or of ammonical compounds, is a characteristic of most cases of animal putrefaction, while other combinations of hydrogen are also formed, especially carburetted hydrogen, together with complicated and often highly infectious vapors or gases, in which sulphur and phosphorus are frequently discerned. These putrefactive effluvia are for the most part easily decomposed or rendered innocuous by the agency of chlorine. The rapidity of putrefaction and the nature of its products are to a great extent influenced by temperature, moisture, and access of air. A temperature between 60° and 80°, a due degree of humidity and free access of air, are the circumstances under which it proceeds most rapidly. Hence the action of the minute organisms which produce putrefaction can be checked or altogether prevented by a very high, or a very low, temperature, by the exclusion of air, and by the absence of moisture. Antiseptics prevent and to some extent arrest the progress of putrefaction.

PUTTY, a kind of paste or cement compounded of whiting or soft carbonate of lime and linseed-oil, beaten or kneaded to the consistence of dough. In this state it is used by glaziers for fixing in the squares of glass in window frames, etc., and also by house-painters to stop up holes and cavities in wood-work before painting.

PUY-DE-DOME (pu-ê-dè-dôm), a department of Central France; area, 3070 sq. miles; takes its name from a volcanic cone (4805 feet) which overlooks it. The highest point in the department, Puy-de-Sancy, 6188 feet, is the most elevated peak of Central France. The industries of the department include paper-making, sugar production, and the manufacture of various textile fabrics. Pop. 544,194.

PYÆMIA (pi-ê-mi-a), blood-poisoning, a dangerous disease resulting from

PYGMALION

the introduction of decaying animal matter, pus, or other morbid product into the system. Such matter may be introduced through an ulcer, wound, an imperfectly closed vein, or a mucous membrane, as that of the nose. This disease was common after severe operations in crowded hospitals, whose atmosphere was loaded with purulent or contaminated matter. It has been much checked of late years by the improved ventilation of hospitals, and by the application of antiseptics in the performance of surgical operations and the dressing of wounds.

PYGMALION, in Greek mythology, a king of Cyprus, who, having made an ivory image of a maiden, fell in love with his own work, and entreated Venus to endow it with life. His prayer was granted, and the maiden became his wife.

PYGMY, one of a race of dwarfs, first mentioned by Homer as dwelling on the shores of Ocean, and having to sustain a war against the cranes every spring. Later writers place them mainly in Africa, Aristotle at the sources of the Nile, and in fact there are dwarfish races in the interior of Africa.

PYLONS, in Egyptian architecture, the name given to powers or masses of

a very imposing appearance. Behind them in the larger temples there was often a large open court, and in front there might be an avenue with sphinxes on either side. An entrance of which these pylons form part is sometimes called a propylon. See Egypt (Architecture).

PYM, John, English statesman and leader of the popular party during the reigns of James I. and Charles I., was born in Somersetshire 1584; studied at Oxford and became famous as a lawyer. He entered parliament in 1614, and during the reign of James he attained



John Pym.

great influence by his opposition to the arbitrary measures of the king. In November, 1643, he was made lieutenant-general of ordnance, and in the following month he died, and was buried in Westminster Abbey.

PYRAMID, in architecture, a colossal structure of masonry having a rectangular base and four triangular sides terminating in a point, used by the ancients in various parts of the world for sepulchres or for religious purposes, especially in Egypt. The largest and most remarkable of the Egyptian pyramids occur in several groups on the west side of the Nile, on the border of the Libyan desert, extending for a distance of about 25 miles from north to south, the farthest north being opposite Cairo. They are built chiefly of the hard limestone of the adjacent hills, but large blocks of granite brought from a distance are also used, especially on the outside. The four sides are so placed as to face the four cardinal points. These structures are supposed to date from about 3000 B.C. to 2300 B.C. The stones used varied in size, but are mostly large, requiring wonderful mechanical skill to quarry them, transport them, and raise and adjust them in their proper places. An almost fabulous number of laborers were engaged in erecting the chief Egyptian pyramids, of which the group of Gizeh, 4 miles S.W. of Cairo, in the neighborhood of the ancient Memphis, is the most remarkable. This group consists of nine pyramids, among them the three most celebrated of all, the pyramid of Cheops (Khufu), called the Great Pyramid; of Cephren (Khafra); and of Mycerinus (Menkauru). According to Herodotus the Great Pyramid took 100,000 men working for ten years to make a causeway 3000 feet long in order to facilitate the transport

of the stone from the quarries; and the same number of men for twenty years more to complete the pyramid itself. Its base forms a square each side of which was originally 768 feet, though now, by the removal of the coating, only 750 feet long, occupying 13 acres. The outer surface forms a series of steps, each of the average height of 3 feet or more.



The pyramids of Gizeh, Egypt.

When the structure was perfect this step formation was hidden by the coating, which rendered the sides quite smooth, and the apex, where there is now a space of 12 sq. yards, was no doubt originally quite sharp. The height was originally about 480 feet, but is now only 451. The interior, entered 49 feet above the base of the north face, contains several chambers, one of which, called the King's Chamber, is 34½ feet long, 17 wide, and 19 high, and contains a sarcophagus of red granite. The second pyramid is 690 feet square and 447 feet high. The third pyramid is only 354 feet square and 203 feet high, and is the best constructed of the three. The six smaller pyramids which complete the Gizeh group are of much inferior interest. The pyramids are supposed to have been built by the respective kings as tombs and memorials of themselves; and it is conjectured that they were begun at the beginning of each reign, and that their size corresponded with the length of it. About 350 yards southwest of the Great Pyramid is the celebrated Sphinx. Ruins of pyramids are to be found at Benares in India and in other parts of the East. Certain monuments of the ancient inhabitants, found in Mexico, are also called pyramids. These seem to have been intended to serve as temples, the tops of them being flat and surmounted by a house or chamber in which sacred rites were probably performed. The largest and perhaps the oldest of them is that of Cholula, which is said to have a base of 1770 feet and a height of 177 feet.

PYRAMUS AND THISBE, a pair of devoted lovers, who, as their story is told by Ovid (*Met.* iv. 55-165), resided in Babylon, and being prevented by their parents from meeting openly, were in the habit of secretly conversing through an opening of the wall, as their houses adjoined. They agreed one day to meet at the tomb of Ninus, when Thisbe, who was the first at the rendezvous, was surprised by a lioness and took to flight. In her haste she dropped her garment, which the lioness seizing



Pylon—Temple of Edfou, Egypt.



Propylon at Karnak, Egypt.

masonry, somewhat resembling truncated pyramids, placed one on each side at the entrance of temples, and having

covered with blood, having immediately before killed an ox. Pyramus appearing on the scene, and concluding from the blood-besmeared robe that Thisbe was dead, killed himself. Thisbe returning soon afterward, and finding the body of her lover, also killed herself. The story was very popular in the time of Shakespeare, who made it the subject of the burlesque interlude in *A Midsummer Night's Dream*.

PYRENEES', a lofty mountain range, the crest of the main chain of which forms the boundary between France and Spain. It abuts with one extremity on the Mediterranean, and with the other on the Atlantic. Its length, from Cape Creux on the Gulf of Lyons, to Fontarabia, on the bay of Biscay, is about 280 miles, and its greatest breadth little more than 50 miles. It consists of two lines, which form parallel ridges about 20 miles apart from each other, except near the center, towards which the range rises both from the east and west. The descent on the south side is much more abrupt than on the north. Its loftiest summits are near its center, where its culminating point, Maladetta, or Pic de Néthou, reaches a height of 11,424 feet. The principal passes in the Pyrenees, formed by the meeting of valleys from opposite sides of the axis, take in the east part of the chain the name of Cols, and toward the center that of Ports. Only four of these are conveniently practicable for carriages. In 1885 the French and Spanish governments agreed to the construction of two railways, of which the tunnels perforating the Pyrenees were to be made at the cost of both countries. In the Pyrenees is to be found some of the finest scenery in France. The climate, genial and warm, banishes perpetual snow to 1300 feet higher than the snow-line of the Alps. The French Pyrenees abound in mineral springs, in connection with which are some of the gayest watering-places in Europe, chief among them Bagnères de Luchon. Barège is in a dreary gorge, but its waters are celebrated for their efficacy.

PYRENEES (pē-rā-nā), the French name of the Pyrenees, giving name to three French departments.—Basses-Pyrénées (bās-pē-rā-nā), is a department of Southwestern France, at the angle of the Bay of Biscay. Its industry is mainly agricultural. The surface is diversified, there is much fine scenery, and the forests are extensive and valuable. Biarritz, its chief watering-place, is well known as a health resort, especially in winter. Pau is the capital of the department. Area, 2943 sq. miles; pop. 432,999.—Hautes-Pyrénées (ōt-pē-rā-nā) is a department of Southern France, bounded partly by Spain, partly by Basses-Pyrénées, and other departments. To it in the south belong some of the loftiest summits of the Pyrenees. The finest scenery and the mineral springs of the department attract many visitors. Area, 1749 sq. miles; pop. 234,825. Tarbes is the capital.—Pyrénées-Orientales (pē-rā-nā-zō-rē-an-tāl), a department of Southern France, bordering on the Mediterranean and the Spanish frontier. Its chief wealth lies in its wines, of which the well-known

Roussillon is one. The department is also very rich in iron. Perpignan is the capital. Area, 1592 sq. miles; pop. 211,187.

PYRHE'LIOMETER, an instrument devised by M. Pouillet for measuring the intensity of the heat of the sun.

PYRITES (pi-rī'tēz), a name given in mineralogy to various metallic sulphides, chiefly to the sulphides of copper and iron. Pyrites is largely used as a source of sulphur in the manufacture of sulphuric acid.

PYROGALLIC ACID, an acid obtained by the dry distillation of gallic acid (which see). It forms crystals that have neither smell nor color, is readily soluble in water, alcohol, and ether, has a neutral reaction, readily absorbs oxygen in an alkaline solution, and becomes of a dark brown color. It is used in photography, and sometimes as a hair-dye.

PYROMETER, any instrument, the object of which is to measure all gradations of temperature above those indicated by the mercurial thermometer.

PYR'OSCOPE, an instrument for measuring the intensity of heat radiating from a hot body, or the frigorific influence of a cold body.

PY'ROTECHNY, the science of making and using artificial fire-works, the chief ingredients of which are nitre, sulphur, and charcoal. Iron filings yield bright red and white sparks. Steel filings and cast-iron borings contain carbon, and give a more brilliant fire with wavy radiations. Copper filings give flame a greenish tint, those of zinc a fine blue color; the sulphurate of antimony gives a less greenish blue than zinc, but with much smoke; amber, resin, and common salt give a yellow fire. Lampblack produces a very red color with gunpowder, and a pink with niter in excess. Verdigris imparts a pale green, sulphate of copper and sal-ammoniac a palm-tree green. Lycopodium, used also in the manufacture of stage-lighting, burns with a rose color and a magnificent flame. See Fire-works.

PYROXYLINE, a term embracing gun-cotton and all other explosive substances obtained by immersing vegetable fiber in nitric or nitro-sulphuric acid, and then suffering it to dry. These substances are nitro-derivatives of cellulose.

PYRRHIC DANCE, an ancient Grecian warlike dance, which consisted chiefly in such an adroit and nimble turning of the body as represented an attempt to avoid the strokes of an enemy in battle, and the motions necessary to perform it were looked upon as a kind of training for war.

PYRRHO, a Grecian philosopher of Elis, founder of the Pyrrhonian or sceptical school, flourished about 340 B.C. A disposition to doubt is often called, from this philosopher, Pyrrhonism.

PYRRHUS, King of Epirus, one of the most illustrious generals of antiquity, was born about 318 B.C. He defeated the Romans in two battles, but with severe loss to himself; then passed over into Sicily, returned to Italy again, and was defeated at Beneventum 275 B.C. He now retired to Epirus, took part in the Greek troubles, and was killed at Argos, B.C. 272.

PYTHAGORAS, a Grecian philosopher, supposed to have been born about 586 B.C. at Samos. He went to Scyros, and was a scholar of Pherecydes till the death of the latter; others make him also a scholar of Thales and Anaximander. He is said to have gathered knowledge from the philosophers or learned men of Phœnicia, Syria, Egypt, Babylon, India, etc., but eventually settled at the Greek city of Crotona in Lower Italy, probably about 529 B.C. His abilities and character led great numbers, chiefly of the noble and wealthy classes, to adopt his views. Three hundred of these were formed into a select fraternity or order, and were bound by vow to Pythagoras and each other, for the purpose of cultivating the rites and observances enjoined by their master, and studying his philosophy. They thus formed at once a philosophical school and a religious order. The political influence of this body became very considerable, and was exerted in the interest of the aristocratic party. The democratic party strenuously opposed the growing power of the order, and their enmity caused Pythagoras to retire to Metapontum, where he died about 506 B.C. His public instruction consisted of practical discourses in which he recommended virtue and dissuaded from vice, with a particular reference to the various relations of mankind, as those of husbands and wives, parents and children, citizens and magistrates, etc. His disciples were required to practice the greatest purity and simplicity of manners. He imposed upon them, it is said, a silence of from two to five years, according to circumstances. He alone who had passed through the appointed series of trials was allowed to hear the word of the master in his immediate presence. To the initiated the doctrines were not delivered, as to others, under the mask of images and symbols, but unveiled. Pythagoras left no writings; the Golden Sentences extant under his name having been composed or compiled by later hands.

PYTHIAN GAMES, one of the four great Grecian games, instituted in honor of Apollo, and celebrated at Delphi. Until about 586 B.C. they were under the management of the Delphians, and took place every eighth year; but after that date they were conducted by the Amphictyons, and celebrated every fourth year, prizes being given for flute-playing, athletic sports, and horse and chariot racing. Eventually contests in tragedy, painting, sculpture, etc., were added. At first prizes of silver or gold were awarded, but afterward the simple laurel wreath and palm-branch were substituted. They continued to be celebrated until the end of the 4th century of our era.

PYTHIAS, Knights of, a fraternal and beneficial order founded in Washington, D. C., in 1864. Its objects are the practice of friendship, benevolence and charity toward the members. Its most binding obligation is complete and absolute secrecy. The first lodge instituted was Washington lodge. In 1868 a new constitution was adopted at Washington under which was organized, as the central governing body, the Supreme Lodge

Knights of Pythias of the World. Its roll of membership exceeds 600,000. The uniform rank is another division of the order. It is under the control of the supreme lodge also, but is directed by an officer whose title is major-general. The members of this grade are on the same plane with the other members, but only those members who have received the rank of knight are eligible for membership. Pythian knighthood confers three ranks or degrees, viz.: The initiatory rank of "page;" the armorial rank of "esquire;" and the chivalric rank of "knight." The motto of the order is: "Be generous, brave, and true."

PYTHON, a genus and family of serpents allied to the family Boidæ or Boas. They are not venomous, but kill their prey by compression. The pythons belong exclusively to the Old World, and are of enormous size, sometimes attaining a length of 30 feet. They are found in India and in the islands of the Eastern Archipelago, in Africa and in Australia. A rudimentary pelvis and traces of hinder limbs exist in the pythons, these structures terminating externally in a kind of hooked claw. The head exceeds

the neck in thickness, and the mouth is extremely large. Aided by their pre-



Python.

hensile tails and rudimentary hinder limbs, the pythons suspend themselves

from the branches of trees and lie in wait near water for animals which come to drink. The genus python contains various species, the best known of which is the West African python, common in menageries. The female python hatches her eggs by the heat of her body.

PYTHONESS, the priestess of Apollo at his temple at Delphi who gave oracular answers. See Delphi.

PYX (Greek, pyxis, a box), a covered vessel used in the Roman Catholic church to contain the consecrated host. In ancient times, although generally rectangular in shape, it sometimes had the form of a dove, and was suspended above the altar. It is now cylindrical, cup or bell shaped, with a cross-surmounted cover, and is frequently delicately chased and inlaid.

PYX, Trial of the, the final trial by weight and assay of the gold and silver coins of the United Kingdom, prior to their issue from the mint, a certain number being taken and tested by way of sample of the whole. The trial takes place periodically by a jury of goldsmiths summoned by the lord-chancellor, and constitutes a public attestation of the standard purity of the coin.

Q

Q, the seventeenth letter in the English alphabet, a consonant having the same sound as k or hard c. It is a superfluous letter in English, as the combination qu, in which it always occurs, could be equally well expressed by kw or k alone when the u is silent. It did not occur in the Anglo-Saxon alphabet, the sound qu in Anglo-Saxon words being regularly written cw or cu, but was borrowed from the French-Latin alphabet.

QUADRANGLE, in geometry, a quadrilateral figure; a plane figure having four sides, and consequently four angles. In ordinary language it is a square or quadrangular court surrounded by buildings, as often seen in the buildings of a college, school, or the like.

QUADRANT, an instrument for measuring angular altitudes, variously constructed and mounted for different specific uses in astronomy, navigation, surveying, etc., consisting originally of a graduated arc of 90°, with an index or vernier, and either plain or telescopic sights, along with a plumb-line or spirit-level for fixing the vertical or horizontal direction. Its principle and application is the same as that of the sextant, by which it is superseded. See Sextant.

QUADRILLE, a dance of French origin, which consists generally of five consecutive figures or movements, danced by four sets of couples, each forming the side of a square.

QUADRUMANA ("four-handed"), the name applied by Cuvier and others to denote the order of mammalia represented by the lemurs, monkeys, and apes, from the fact that these forms agree in possessing a great toe so constructed as to be capable of opposing the other digits of the feet, instead of being placed parallel with the other toes, thus forming a kind of "hand" adapted for supporting the foot on the ground.

QUADRUPED, the name popularly applied to those higher vertebrate animals which possess four developed limbs. The name is usually restricted to four-footed mammals.

QUADRUPLE ALLIANCE, an alliance, so called from the number of the contracting parties, concluded in 1718 between Great Britain, France, and Austria, and acceded to by Holland in 1719, for the maintenance of the Peace of Utrecht. The occasion of the alliance was the seizure by Spain of Sardinia in 1717, and Sicily in 1718, both of which she was forced to give up.

QUÆSTOR, the name of certain magistrates of ancient Rome whose chief office was the management of the public treasure, being receivers of taxes, tributes, etc.

QUAGGA, a species of the horse genus, nearly allied to the zebra, and formerly found on the plains of Southern Africa. Striped like the zebra, it yet possessed no bands on the limbs; of a dark or blackish-brown on the head, neck, and shoulders, the back and hind quarters were of a lighter brown, while the croup was of a russet gray. The under parts of the body were white, the upper parts of the legs and tail being marked by whitish bars. The quagga was of smaller size than the zebra, and in general conformation bore a closer resemblance to the horse. Gregarious in habits, the quagga is said to have mingled indiscriminately with the zebra herds. Its food consisted of grasses and mimosa leaves. It is now said to be absolutely extinct. The animal to which the name quagga is now applied is Burchell's zebra.

QUAIL, a genus of rasorial birds, included in the family of the partridges, to which they are nearly allied, but from which they differ in being smaller, in having a relatively shorter tail, no red

space above the eye, longer wings, and no spur on the legs. The common quail is a migratory bird, and is found in every country of Europe, and in many parts of Asia and Africa. It is about 8 inches in length. The color of the upper parts is brownish with lighter and darker markings, of the under parts yellowish. The quail is very pugnacious, and in some places quail fights are a form of amusement, as was the case also in ancient times. Its flesh is deemed excellent food, and large numbers are brought alive and dead from the conti-



Bob-white, or common quail of America.

nent to the British markets. In Britain these birds arrive early in May, and depart southward in October. There are several other species, in appearance and habits not greatly differing from the common quail, as the Coromandel quail, the Australian quail, the white throated quail, the Chinese quail, an elegant little species measuring only 4 inches in length, etc. The name of quail is also given to some birds of other genera, as the Virginia or Maryland quail, and the Californian or crested quail. The Virginian quail is common throughout

North America, and extends as far south as Honduras. It is rather larger than the European quail. The flesh is very white and tender, and is unequalled in delicacy by any other member of its order in America.

QUAKERS, a society of Christians which took its rise in England about the middle of the 17th century. George Fox, a native of Drayton, in Leicestershire, was the first to teach the religious views which distinguish the society. He commenced his ministerial labors in 1647, and immediately fell under persecution. But persecution, as usual, enlisted the sympathies of many in his cause. After making multitudes of converts he organized them into a church, which became, although not until after severe persecution, one of the recognized sects of Christianity. Among the other eminent members of the society in its early days we may mention William Penn, Robert Barclay, George Whitehead, Stephen Crisp, Isaac Pennington, John Crook, Thomas Story, etc. The early Quakers were marked as a peculiar people by their testimonies against oaths, a paid ministry, and tithes; their use of the singular pronouns when addressing only one person; their refusal to take off the hat as a compliment to men; the plainness of their apparel; and their disuse of the ordinary names of the months and days. The name Quakers was given to them in derision, and though they accepted the name they call themselves by that of Friends. One of the brightest chapters in the annals of Quakerism is that relating to the founding of the colony of Pennsylvania. (See Penn, William, Pennsylvania.)

The society, or the orthodox section of it, believes that, under the gospel dispensation, all wars and fightings are strictly forbidden; the positive injunction of Christ, "Love your enemies," etc., entirely precluding the indulgence of those passions from which only such contests can arise. They also believe that the express command, "Swear not at all," prohibits the Christian from the use of judicial as well as other oaths. In like manner, following the spirit of the Scriptures, they believe that a special call is necessary to constitute a true minister of the gospel, that the faithful minister should not preach for a pecuniary reward, that the essential baptism is of the Holy Ghost, not by water, and that the Lord's supper is also entirely of a spiritual nature. They therefore renounce both these sacraments so far as the ordinary outward forms are concerned. As to the cardinal doctrines of Christianity, the incarnation, crucifixion, resurrection, redemption through Christ's death, justification, etc., their beliefs are similar to those of orthodox Christians generally. The Quakers were one of the first sects to allow women to teach publicly. As early as 1727 they censured the traffic in slaves, and the efforts of the society had a great influence in bringing about their emancipation. They object to balls, gaming-places, horse-races, theaters, and music; also to the reading of plays, romances, and novels; and enjoin plainness of dress and the avoidance of ornaments.

The society is governed by its own

code of discipline, which is enacted and supported by meetings of four degrees for discipline—namely, preparative, monthly, quarterly, and yearly meetings. The preparative digest and prepare the business for the monthly meetings, in which the executive power is principally lodged, subject, however, to the revision and control of the quarterly meetings, which are again subject to the supervision and direction of the yearly meetings. There are about 60,000 members and adherents in Britain, about 95,000 in the United States and Canada, besides small numbers in other countries.

QUANTITY, that property of anything, in virtue of which it is capable of being measured, increased, or diminished, relating to bulk, weight, or number. In mathematics a quantity is anything to which mathematical processes are applicable. In grammar it signifies the measure of a syllable, or the time in which it is pronounced—the metrical value of syllables as regards length or weight in pronunciation. In Latin and Greek poetry quantity and not accent regulates the measure.

QUARANTINE, the period (originally forty days) during which a ship coming from a port suspected of contagion, or having a contagious sickness on board, is forbidden intercourse with the place at which she arrives. This form of quarantine is now confined to foreign countries where cholera, yellow fever, etc., have to be guarded against. In Britain quarantine is altogether abolished. If there be evidence or suspicion of infectious disease on board a vessel arriving in a British port, the customs-officers report the same to the port sanitary authorities, who have power to deal with cases under the public health acts. Quarantine was originally introduced at Venice as a measure of protection against plague or leprosy about the middle of the 14th century. Venice, then the chief trading center of the Mediterranean, being especially liable to contagion through vessels coming from Eastern ports. A lazaretto was early erected here in connection with the quarantine restrictions. In the United States it is a misdemeanor punishable by a fine or imprisonment, or both, for the master, pilot, or owner of any vessel entering a port of the United States in violation of the quarantine law passed in 1888, or regulations framed under it.

QUARREL, a bolt or dart to be shot from a cross-bow, or thrown from a catapult, especially one with a square head and pyramidal point.

QUARRY, an open excavation made for obtaining stone, such as granite, marble, sandstone, limestone, and slates. Stones suitable for important building purposes are usually found at a good distance below the surface. In the case of unstratified rocks, such as granite, whinstone, etc., the stone is most frequently detached from the mass by blasting, a process by which much valuable stone is wasted, and a different method is employed whenever it is found possible. This is frequently the case with some stratified rocks, such as sandstone, from which blocks are separated by hand-tools alone. Small holes a few

inches asunder are cut along a certain length of rock, into which steel wedges are inserted. These are driven in by heavy hammers until the stratum is cut through. The large blocks necessary for monumental purposes are generally obtained in this way, and before they leave the quarry they are usually reduced as nearly as possible to a rectangular form.

QUART, an English measure of capacity, being the fourth part of a gallon, or 8 gills.

QUARTER-DECK, the upper deck, or aftermost part of the upper deck, of a vessel, extending from the main-mast to the stern, or to the poop (when there is one). In ships of war it is especially set apart for the officers.

QUARTERING, in heraldry, is dividing a coat into four or more quarters or quarterings, by perpendicular and horizontal lines, etc. See Heraldry.

QUARTER-MASTER, in the army, an officer who attends to the quarters for the soldiers, their provisions, fuel, forage, etc. There is a quarter-master attached to every regiment, battalion, etc., who generally holds the relative rank of lieutenant. A quarter-master in the navy is a petty officer appointed by the captain, who, besides having charge of the stowage of ballast, and provisions coiling of ropes, etc., attends to the steering of the ship.

QUARTERMASTER-GENERAL, a staff officer of high rank in the army, whose department is charged with all orders relating to the marching, embarking, disembarking, billeting, quartering, and cantoning of troops, encampments and camp equipage. The quarter-master-general is attached to a whole army under a commander-in-chief, and generally holds the rank of major-general while to every brigade is attached a deputy-assistant quarter-master-general.

QUARTERN, a term sometimes used to designate the fourth of a peck, or of a stone; as the quartern-loaf. In liquid measure it is the fourth part of a pint.

QUARTET, or **QUARTETTE**, a musical composition for four instruments, generally stringed instruments (that is, two violins, one viola or tenor violin, and one violoncello); also a composition for four voices, with or without accompaniment.

QUARTO (4to), a book of the size of the fourth of a sheet; a size made by twice folding a sheet, which then makes four leaves.

QUARTZ, the name given to numerous varieties of the native oxide of silicon, called also silicic acid. Quartz embraces a large number of varieties. It occurs both crystalized and massive, and in both states is most abundantly diffused throughout nature, and is especially one of the constituents of granite and the older rocks. When crystalized it generally occurs in hexagonal prisms, terminated by hexagonal pyramids. It scratches glass readily, gives fire with steel, becomes positively electrical by friction, and two pieces when rubbed together become luminous in the dark. The colors are various, as white or milky, gray, reddish, yellowish or brownish, purple, blue, green. Quartz veins are often found in metamorphic rocks, and

frequently contain rich deposits of gold. The principal varieties of quartz known by distinct names are the following: 1, rock-crystal; 2, smoky quartz; 3, yellow quartz; 4, amethyst; 5, siderite or blue quartz; 6, rose quartz; 7, milky quartz; 8, irised quartz; 9, common quartz; 10, fat (greasy) quartz; 11, flint; 12, hornstone; 13, Lydian stone; 14, float stone (swimming stone); 15, fibrous quartz; 16, radiating quartz; 17, chalcedony; 18, carnelian; 19, chrysoprase; 20, agate. The name rock-crystal is applied to transparent and colorless crystals. Smoky quartz consists of crystals and crystalline masses which are translucent and of a brown color. Yellow quartz, sometimes called Bohemian or Scottish topaz, is transparent, and of various shades of yellow. Amethyst is of every shade of violet, and nearly transparent. Siderite is of an azure-blue color, and never in regular crystals. Rose quartz is of a rose-red color. Milky quartz is massive, translucent, and of a milk-white color. Irised quartz exhibits the colors of the rainbow. Fat or greasy quartz has the appearance of having been immersed in oil. Flint has a more compact texture than common quartz, is dull, only translucent on the edges, of a brownish color, and breaks with a conchoidal fracture. Hornstone resembles flint, but its conchoidal fracture is less distinct. Lydian stone differs from flint chiefly in having a darker color, less translucency, and a fracture somewhat slaty; when black it is often called basanite. Floatstone consists of a delicate tissue of minute crystals, visible only under a powerful magnifier. Owing to the cavities it contains it will sometimes float on water. Fibrous quartz consists of those varieties which are in distinct parallel concretions. Radiating quartz is like fibrous quartz, except that the fibers diverge from a common center, and resemble the radii of a circle, instead of being parallel. Chalcedony includes those varieties of radiating quartz where the thickness of the individuals becomes so much diminished as to render them nearly or altogether impalpable. Carnelian differs from chalcedony merely in having a blood-red color. Chrysoprase also resembles chalcedony in composition, except that it is granular instead of fibrous; its color is apple-green. Agate implies the occurrence of two or more of the above varieties existing together in intimate union. Cat's-eye, aventurine, prase, plasma, heliotrope, Compostella hyacinth, jasper (red, brown, striped, and porcelain), jasperagate, Mocha stone, Venus hair agate, etc., formerly included under quartz, are only mixtures of this mineral with other substances. Several varieties of quartz are of important use in the arts and manufactures. The ancients regarded rock-crystal as petrified water, and made use of it for the fabrication of vases. At present it is employed not only for cups, urns, chandeliers, etc., but for seals, spectacle-glasses, and optical instruments. Quartz enters into the composition of glass, both white and colored. In the manufacture of porcelain it is added in the state of an impalpable powder, and forms part of the paste; it is also used in other

kinds of pottery. Quartz is used as a fluid in the melting of several kinds of ores, particularly those of copper, and in other metallurgical processes. Touchstone is a hard velvety-black variety of Lydian stone.

QUATREFOIL (kwa'tér-foil), in architecture, an opening or a panel divided by cusps or foliations into four leaves, or more correctly the leaf-shaped figure formed by the cusps. It is an ornament which has been supposed to represent the four leaves of a cruciform flower,



Quatrefoils.

and is common in the tracery of Gothic windows. Bands of small quatrefoils are much used as ornaments in the perpendicular Gothic style, and sometimes in the decorated. The same name is also given to flowers and leaves of similar forms carved as ornaments on mouldings, etc.

QUAVER, a note and measure of time in music, equal to half a crotchet or the eighth of a semibreve. See Music.

QUAY (kē), a landing-place substantially built along a line of coast or a river bank, or round a harbor, and having posts and rings to which vessels may be moored, frequently also cranes and storehouses for the convenience of merchant ships.

QUAY (kwā), Matthew Stanley, American politician, born in Dillsburg, York co., Pa., in 1833. During the civil war he was assistant commissary-general of the state, and military secretary to the governor. He was a member of the legislature from 1865 to 1867; secretary of state for Pennsylvania from 1872 to 1878, recorder of Philadelphia from 1878 to 1879, again secretary of state from 1879 to 1882, elected state treasurer in 1885, and was chosen United States senator in 1887. In 1888 he was chairman of the executive committee of the republican national committee. He was re-elected to the senate in 1893, but failed to succeed himself in 1899, because of a deadlock which lasted throughout the session of the legislature. He was appointed senator by the governor, but the senate refused to recognize the appointment. He was, however, nominated to succeed himself by the republican state convention, and in 1901 was re-elected for the term to expire in 1905. He died in 1904.

QUEBEC, a city and shipping port of the Dominion of Canada, capital of the province of the same name, situated on a promontory near the confluence of the St. Charles with the St. Lawrence, terminating abruptly in Cape Diamond, which has a height of 333 feet, and on the banks of both streams. It is about 400 miles from the mouth of the St. Lawrence and 140 miles northeast of Montreal, to which the river is navigable for large vessels. On the Plains of Abraham, west of the upper town, a column 40 feet high has been erected to the memory of General Wolfe; while in the upper town there is a handsome obelisk, 65 feet high, to the joint memory of the

two commanders, Wolfe and Montcalm, who both fell at the taking of Quebec. Ship-building is the chief industry. There are also manufactures of iron-castings, machinery, cutlery, nails, leather, paper, india-rubber goods, rope, tobacco, beetroot-sugar, etc. Quebec is the chief seat of the Canadian trade in timber, immense quantities of which are here accumulated, so that at certain seasons rafts moored within booms may be seen extending along the water's edge for 6 miles. Pop. 75,000.

QUEBEC, a province of the Dominion of Canada. It is bounded on the n. by Labrador and the northeast territory of Canada; on the e. by Labrador and the Gulf of St. Lawrence; on the s. by the Chaleurs bay, New Brunswick, and the states of Maine, New Hampshire, Vermont, and New York; and on the s.w. by the River Ottawa, which separates it from the province of Ontario. It is nearly 1000 miles in length from e. to w. by 300 in breadth, and has an area of 188,694 sq. miles. The climate is variable, though salubrious, the temperature ranging from 20° below zero in winter to 90° in summer. The soil is generally fertile, and well suited for the growth of cereals, hay, etc.; corn, flax, and tobacco are also grown, especially to the west of the longitude of Quebec, while grapes, melons, peaches, and tomatoes in this region come to maturity in the open air. A large portion of the province is still covered with forest, the white and red pines and the oak being the most valuable trees for timber. The fisheries are extensive and valuable. The minerals worked include apatite, asbestos, gold, copper, iron, plumbago, etc. The manufactures are steadily increasing, and include furniture, leather, paper, chemicals, boots and shoes, woolen goods, steam and agricultural machinery. The chief exports are timber and fish. The educational system embraces institutions of all grades, from primary schools upward, at the top being three universities—Laval university, Quebec (Roman Catholic); McGill university, Montreal (Protestant); and Bishop's college, Lennoxville (Anglican). The affairs of the province are administered by a lieutenant-governor (appointed by the governor-general) and an executive council composed of 8 members, assisted by a legislative assembly of 74 members and a legislative council of 24 members. The latter hold their appointments for life; the former are elected by the people for five years. The capital is Quebec, but Montreal is the largest town. Pop. 1,620,974.

QUEEN, a woman holding a position similar to that of king. In Britain the queen is either queen-consort or merely wife of the reigning king, who is in general (unless where expressly exempted by law) upon the same footing with other subjects, being to all intents the king's subject, and not his equal; or queen-regent, regnant, or sovereign, who holds the crown in her own right, and has the same powers, prerogatives, and duties as if she had been a king, and whose husband is a subject; or queen-dowager, widow of the king, who enjoys most of the privileges which belong to her as queen-consort. In Prussia,

Sweden, Belgium, and France there can be no queen-regent. See Salic Law.

QUEEN CHARLOTTE ISLANDS, a group of islands in the North Pacific ocean, off the mainland of British Columbia, north of Vancouver island, discovered by Cook about 1770, and annexed to the British crown about 1787.

QUEEN'S COUNTY, a county of Ireland, in the province of Leinster, with an area of 664 sq. miles. Pop. 57,226.

QUEENSLAND, an Australian colony, comprising the whole northeast portion of Australia north of New South Wales and east of S. Australia and its northern territory, being elsewhere bounded by the Gulf of Carpentaria, Torres strait, and the Pacific. A considerable portion is thus within the tropics, the most northern part forming a sort of peninsula, known as York peninsula. It has an area of about 668,224 sq. miles, and is divided into twelve large districts, namely, Moreton (east and west), Darling Downs, Burnett, Port Curtis, Maranoa, Leichhardt, Kennedy, Mitchell, Warrego, Gregory, Burke, and Cook. Most of these districts are now subdivided into counties. Toward the west a large portion of the surface is dry and barren, but toward the east, and for a long stretch along the coast, boundless plains or downs, admirably adapted for sheep-walks, and ranges of hills, generally well wooded and intersected by fertile valleys, form the prevailing features of the country. The coast is skirted by numberless islands, and at some distance is the Great Barrier Reef. The highest mountains are near the coast, the greatest elevation being about 5400 feet. The principal rivers are the Brisbane, the Burnett, the Pioneer the Fitzroy, and the Burdekin flowing into the Pacific, and the Flinders and Mitchell into the Gulf of Carpentaria. Some of these streams are navigable for a considerable distance inland. The coast is indented with many noble bays, affording some capacious natural harbors, which have already been brought into practical use as the outlets for the produce of the adjacent districts. The climate is healthy, and the temperature comparatively equable. The mean temperature at Brisbane is 69°, the extreme range being from 35° to 106°. In the more northern parts the climate is tropical. The rainfall in the interior is scanty and variable; the mean at Brisbane is about 35 inches. The indigenous animals and plants are similar to those of the rest of Australia. Pop. 525,262.

QUEENSTOWN, formerly Cove of Cork, a maritime town of Ireland, and



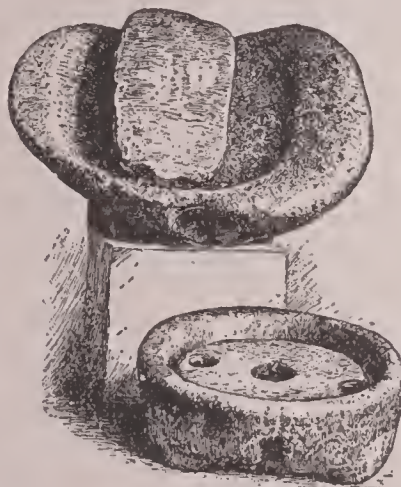
an important naval station, 9 miles

southeast of Cork, on the south side of Great island, which rises abruptly out of Cork harbor to a considerable elevation. It is the port for the transmission of American mails, and a chief emigration station. It has little trade and no manufactures, being almost solely dependent on the military and naval establishments in its vicinity. Pop. 7909.

QUENTIN', St. (san kân-tan), an ancient town of France, department of Aisne, on a height above the Somme, 87 miles n.e. of Paris, which from its position on the frontiers between France and the Low Countries figures much in history. Pop. 50,150.

QUERETARO (ke-râ'tâ-rô), a city in Mexico, capital of the state of the same name, on a plateau 6365 feet above sea-level, 110 miles northwest of Mexico. Pop. 33,152.—The state of Querétaro has an area of 3207 sq. miles, and forms part of the central plateau of the Cordillera, presenting a very rugged surface, traversed by mountain spurs and lofty heights. Grain and cattle form the chief wealth of the state. The minerals are comparatively unimportant. Pop. 232,389.

QUERN, a hand-mill for grinding corn, such as is or has been in general use among various primitive peoples. In using the quern the grain is dropped with one hand into the central opening, while with the other the upper stone is re-



Stone querns for grinding.

volvcd by means of a stick inserted in a small opening near the edge. Hand-mills of this description are used in parts of Scotland and Ireland to the present day.

QUESNAY (kâ-nâ), François, a French physician of some eminence, but chiefly noted as a writer on political economy, born in 1694, died in 1774. He was the author of various surgical and medical works; of several articles in the Encyclopédie, in which he expounds his economical views; and tracts on politics, including a treatise on the Physiocratic System (1768).

QUETELET (kât-lâ), Lambert Adolphe Jacques, Belgian statistician and astronomer, born at Ghent in 1796, studied at the lyceum of his native town, where, in 1814, he became professor of mathematics. A member of the Belgian Royal academy, he became its perpetual secretary in 1834. Quetelet's writings

on statistics and kindred subjects are very numerous. He also published many papers on meteorology, astronomy, terrestrial magnetism, etc. Died 1874.

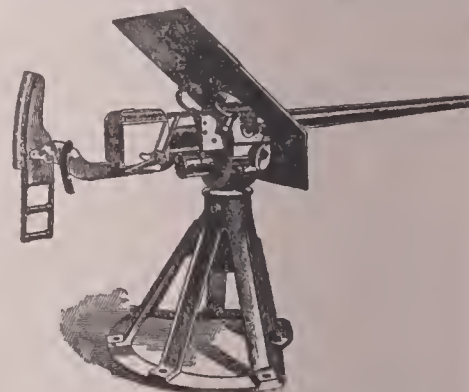
QUEZAL, a most beautiful Central American bird. It is about the size of a magpie, and the male is adorned with tail-feathers from 3 to 3½ feet in length, and of a gorgeous emerald color. These feathers are not strictly speaking the true tail-feathers (the color of which is black and white), but are the upper tail coverts of the bird. The back, head (in-



Quezal.

cluding the curious rounded and compressed crest), throat, and chest are of the same rich hue, the lower parts being of a brilliant scarlet. The female wants these long feathers, and is otherwise much plainer. The food of the quezal consists chiefly of fruits. It lives in forests of tall trees. There are several allied species of birds, but none with the distinctive feature of the quezal.

QUICK-FIRING GUNS, a type of ordnance of recent introduction, consisting of breech-loading guns of comparatively small size, the projectile and powder for which are combined together in a metallic cartridge-case, so that loading and



Hotchkiss six-pounder with deck mount.

firing are thus facilitated. They are mounted on special carriages provided with steel shields to protect the gunners, are fitted with special gear for handling and aiming, and are fired by electricity.

QUICKSAND, a large mass of loose or moving sand mixed with water formed on many sea-coasts, dangerous to persons who trust themselves to it and find it unable to support their weight.

QUI'ETISM, a religious movement in the Roman Catholic church at the close

QUINCE

of the 17th and beginning of the 18th centuries, largely of a mystic character.

QUINCE, the fruit of the quince-tree, which is supposed to be a native of Western Asia, but is now cultivated throughout Europe, and in many parts of the United States for its handsome



Quince.

golden yellow fruit, which, though hard and austere when plucked from the tree, becomes excellent when boiled and eaten with sugar, or preserved in syrup, or made into marmalade.

QUINCEY, Thomas de. See De Quincy.

QUINCY, a town in Adams co., Illinois, on the left bank of the Mississippi, 105 miles northwest of St. Louis. It is an important railway center; has an extensive river traffic, and various manufacturing establishments including tobacco manufactories, foundries, machine-shops, saw and flour mills, and an extensive and rapidly increasing trade. Pop. 1909, estimated at 40,000.

QUINCY, a town in Norfolk co., Massachusetts, on a branch of Boston harbor, about 7 miles from Boston. Its most important and lucrative industry is the working of the quarries which furnish the well-known Quincy granite. The fisheries also are important, and a considerable number of vessels are fitted out in the building-yards. Pop. 26,314.

QUINCY, Josiah, an American writer, born at Boston 1772, died 1864. Educated for the law, he made politics his profession, and was a member of con-



Josiah Quincy

gress from 1804 to 1812. Then he was elected a member of the senate of the legislature of Massachusetts, a position which he held till 1821, in which year he held the office of speaker of the house. From 1823 to 1828 he was mayor of Boston and effected various important reforms. From 1829 to 1845 he was president of Harvard college. His principal works are History of Harvard

University; Municipal History of the Town and City of Boston during Two Centuries; Life of John Quincy Adams.

QUIN'INE, a white, crystalline alkaloid substance, inodorous, very bitter, and possessed of marked antifebrile properties. It is obtained from the bark of several trees of the order Cinchonaceæ (see Cinchona), but perhaps the best is that from calisaya bark. It was discovered about 1820, and has entirely superceded the use of the bark itself in medicine, being most commonly used in the form of sulphate of quinine. The extraordinary value of quinine in medicine as a febrifuge and tonic has given rise to a large trade in Peruvian bark, and has caused the cinchona tree to be extensively planted in India and elsewhere. Quinine in small doses is stomachic, in large doses it causes extreme disturbance of the nerves, headache, deafness, blindness, paralysis, but seldom death.

QUINQUAGESIMA, name of the Sunday before Lent, because fifty days before Easter.

QUINSY, the common name for inflammation of the tonsils. The inflammation is generally ushered in by a feeling of uneasiness in the part. The voice is thick, and there is often swelling of the glands of the neck, with loss of appetite, thirst, headache, and a considerable degree of general fever. The tonsils, uvula, and even the soft palate are swollen and vascular, and the tongue is foul and furred. In severe cases respiration is considerably impeded, and swallowing is always difficult and painful. The inflammation of the throat may terminate either in resolution or supuration. The most frequent cause of quinsy is cold, produced by sudden changes of temperature. But in a great many cases it will be found that the patient has been predisposed to the disease, owing to a bad state of the digestive organs. The best treatment to ward off an attack is to administer a dose of some strong purgative saline medicine. Bland soothing drinks should be given during the course of the disease, and sucking small pieces of ice give much relief.

QUINTAIN, a figure or other object set up to be tilted at with a lance. It was



Ancient quintain at Offham, Kent.

constructed in various ways; a common form in England consisted of an upright

QUOITS

post, on the top of which was a horizontal bar turning on a pivot; to one end of this a sand-bag was attached, on the other a broad board; and it was a trial of skill to tilt at the board end with a lance, and pass on before the bag of sand could whirl round and strike the tilter on the back.

QUINTET', a vocal or instrumental composition in five parts, in which each part is obligato, and performed by a single voice or instrument.

QUINTIL'IAN, Marcus Fabius Quintilianus, a Roman rhetorician, born at Calagurris (Calahorra) in Spain, probably between 35 and 40 A.D.; died about 118. He began to practice as an advocate at Rome about A.D. 69, and subsequently became a teacher of rhetoric. His work, *De Institutione Oratoria*, contains a system of rhetoric in twelve books, and includes some important opinions of Greek and Roman authors.

QUIRE, twenty-four sheets of paper. Twenty quires make a ream.

QUIRINAL, one of the seven hills of ancient Rome. There is a palace here, begun in 1574, and formerly a summer residence of the popes, but since 1871 the residence of the King of Italy. See Rome.

QUIT-CLAIM, in law, signifies a release of any action that one person has against another. It signifies also a quitting of a claim of title to lands, etc.

QUITO (kē'tō), the capital of Ecuador, in a ravine on the east side of the volcano of Pichincha, 9348 feet above the sea, a little to the south of the equator. It has repeatedly suffered from earthquakes. Pop. about 80,000, largely consisting of half-breeds and Indians.

QUIT-RENT, in law, a small rent payable by the tenants of most manors, whereby the tenant goes quit and free from all other services.

QUOITS, a game played with a flattish ring of iron, generally from 8½ to 9½ inches in external diameter, and between 1 and 2 inches in breadth. It is convex on the upper side and slightly concave on the under side, so that the outer edge curves downward, and is sharp enough to cut into soft ground. The game is played in the following manner: Two pins, called hobs, are driven into the ground from 18 to 24 yards apart; and the players, who are divided into two sides, stand beside one hob, and in regular succession throw their quoits (of which each player has two) as near the other hob as they can, giving the quoit an upward and forward pitch with the hand and arm, and at same time communicating to it a whirling motion so as to make it cut into the ground. The side which has the quoit nearest the hob counts a point toward game, or if the quoit is thrown over the hob, it counts two.

QUORUM, a term used in commissions, of which the origin is the Latin expression, *quorum unum A. B. esse volumus* ("of whom we will that A. B. be one"), signifying originally certain individuals, without whom the others could not proceed in the business. In legislative and similar assemblies a quorum is such a number of members as is competent to transact business.

R

R is the eighteenth letter of the English alphabet, classed as a liquid and semi-vowel. In the pronunciation of Englishmen generally it represents two somewhat different sounds. The one is heard at the beginning of words and syllables, and when it is preceded by a consonant; the other, less decidedly consonantal, is heard at the end of words and syllables, and when it is followed by a consonant. In the pronunciation of many English speakers, r, followed by a consonant at the end of a syllable, is scarcely heard as a separate sound, having merely the effect of lengthening the preceding vowel; when it is itself final, as in bear, door, their, etc., it becomes a vowel rather than a consonant.—The three Rs, a humorous and familiar designation for Reading, Writing, and Arithmetic. It originated with Sir William Curtis, who, on being asked to give a toast, said, "I will give you the three Rs, Writing, Reading, and Arithmetic."

RABBI, a title of honor among the Hebrews, corresponding nearly to the English master. There are two other forms of the title, rabboni and rabbani, the former of which is found in the New Testament. It is supposed that this title first came into use at the period immediately preceding the birth of Christ. In the time of our Lord it was applied generally to all religious teachers, and hence sometimes to Christ himself. Now the term rabbi or rabbini is applied to regularly appointed teachers of Talmudic Judaism.

RABBIT, a genus of rodent mammals, included in the family Leporidae, to which also belong the hares. It is of smaller size than the hare, and has shorter ears and hind legs. The rabbit's fur in its native state is of a nearly uniform brown color, whilst under domesti-



Rabbit (white lop-eared variety).

cation the color may become pure white, pure black, piebald, gray, and other hues. The texture of the fur also changes under domestication. The rabbit is a native of all temperate climates, and in its wild state congregates in "warrens" in sandy pastures and on hill-slopes. Rabbits breed six or seven times a year, beginning at the age of six months, and producing from five to seven or eight at a birth. They are so prolific that they may easily become a pest as in Australia, if not kept in check by beasts and birds of prey. They feed on tender grass and herbage, and sometimes do great damage to young trees by stripping them of their bark. They grow exceedingly tame under domestication, and sometimes exhibit considerable intelligence. Rab-

bits are subject to certain diseases, such as rot—induced probably by damp and wet—parasitic worms, and a kind of madness. The skin of the rabbit is of considerable value; cleared of hair, it is used with other skins to make glue and size. The fur is employed in the manufacture of hats, and to imitate other and more valuable furs, as ermine, etc.

RABELAIS (râb-lâ), François, a humorous and satirical French writer, born in or before 1495, the son of an apothecary, of Chinon in Touraine. He entered the Franciscan order at Fontenay-le-Comte, in Poitou, and received the priesthood. In the course of a few years we find him at Montpellier, where he studied medicine, having by this time become a secular priest; he was admitted bachelor in 1530, and for some time successfully practiced and taught. In 1532 he went to Lyons, where he published a work of Hippocrates and one of Galen, and the first germ of his *Gargantua* (1532 or 1533). The first part of his *Pantagruel* appeared under the anagram of Alcofribas Nasier, within a year or so after the former work, and its success was such that it passed three editions in one year. Soon after its publication Rabelais accompanied Jean du Bellay on an embassy to Rome. On his return to France he went first to Paris; but not long after he is found once more at Lyons, where the *Gargantua*, as we now have it, first saw the light (1535). The *Gargantua* and *Pantagruel* together form a single work professing to narrate the sayings and doings of the giant *Gargantua* and his son *Pantagruel*. The next few years were as unsettled as regards his abode as any previous period of Rabelais' life, and it is difficult to follow him. Probably he was in Paris in 1546, when the third book of his *Gargantua* and *Pantagruel* appeared, but during most of 1546 and part of 1547 he was physician to the town of Metz. In the third book all the great moral and social questions of the day were discussed with the gaiety and irony peculiar to Rabelais, and with a freedom that roused the suspicion of the clergy, who endeavored to have it suppressed. The favor of the king secured its publication, but it was with more difficulty that a license was obtained for the fourth book from Henry II., who had succeeded François in 1547. This book did not appear complete till 1552. About 1550 Rabelais was appointed to the cure of Meudon, but he resigned his position in 1552, and died a year later according to most authorities. He left the whole of the fifth book of his remarkable romance in manuscript. By many Rabelais has been set down as a gross buffoon, and their is much in his writings to justify the harsh judgment, though we must remember what was the taste of his times. As regards the purpose of his work, many have looked upon Rabelais as a serious reformer of abuses, religious, moral, and social, assuming an extravagant masquerade for the purpose of protecting himself from the possible consequences of his assaults on established institutions.

RABIES (râ'bi-ēz), the name given to a disease, probably a kind of blood-poisoning, with which dogs, horses, cats, wolves, and other animals are attacked, and to which, indeed, all animals are said to be liable. A bite from some rabid animals induces hydrophobia in man. See Hydrophobia.

RACE-HORSE, a horse bred or kept for racing or running in contest, called also a blood-horse and a thorough-bred horse. The American race-horse is perhaps the finest horse in the world as regards speed for a moderate distance. It is of Arabian, Berber, or Turkish extraction, improved and perfected by the influence of the climate, and by careful crossing.

RACHEL (râ-shell), Mademoiselle (Elizabeth Rachel Felix), a French tragédienne, of Jewish extraction, born in 1821; died in 1858. Her reputation was speedily established as the first tragic actress of her day. In 1841 she visited England, and was received with the greatest enthusiasm. Her renown continued to increase, and for many years she reigned supreme at the Théâtre Français, making also tours to the provincial towns of France, to Belgium, etc. Later she visited America, but when there caught a severe cold, which terminated in consumption. She was of a fierce and unlovable temper, destitute of moral principle, and very avaricious.

RACINE (ra-sên'), a town in Racine co., Wisconsin, on the west shore of Lake Michigan. It has a fine harbor, and enjoys considerable trade. It has iron-foundries, manufactures of machinery and agricultural implements; tanneries and flour-mills, and extensive railway-carriage works. Pop. 33,302.

RACINE (râ-sên), Jean Baptiste, a distinguished French dramatist, born at La Ferté-Milon (Aisne) 1639, died at Paris 1699. He was educated at Port-Royal, the famous Jansenist institution, and latterly at the Collège d'Harcourt. After writing an ode, called *Nymphes de la Seine*, in honor of the king's marriage, and two comedies, now lost, he made the acquaintance of Boileau and Molière, and began to write for the stage. His first tragedy, the *Thébaïde*, or *Les Frères Ennemis*, was performed by Molière's troupe at the Palais-Royal in 1664, as was also his next, *Alexandre*, in 1665. His first master-piece was *Andromaque*, which on its performance at the Hôtel de Bourgogne, in 1667, produced a profound impression. The immediate successor of *Andromaque* was *Les Plaideurs* (1668), a witty and delightful imitation of the *Wasps* of Aristophanes. His next pieces were *Britannicus* (1669); *Bérénice* (1670); *Bajazet* (1672); *Mithridate* (1673); *Iphigénie* (1674); *Phèdre* (1677), the last piece that Racine produced expressly for the theater. In 1673 he obtained a seat in the French academy. His death is said to have been hastened by grief at losing the favor of the king. As a dramatist Racine is usually considered the model of the French classical tragic drama, and in estimating his powers in this field it is necessary to take into account

the stiff conventional restraints to which that drama is subjected. What he achieved within these limits is extraordinary. Besides his dramas Racine is the author of epigrams, odes, and hymns, etc.

RACK, an instrument for the judicial torture of criminals and suspected persons. It was a large open wooden frame within which the prisoner was laid on his back upon the floor, with his wrists and ankles attached by cords to two rollers at the end of the frame. These rollers were moved in opposite directions by levers till the body rose to a level with the frame; questions were then put, and if the answers were not deemed satisfactory, the sufferer was gradually stretched till the bones started from their sockets. It was formerly much used by civil authorities in the cases of traitors and conspirators; and by the members of the Inquisition, for extorting a recantation from imputed heretical opinions. The rack was introduced into England in the reign of Henry VI., and although declared by competent judges to be contrary to English law, there are many instances of its use as late as the time of Charles I.

RACK, in machinery, a straight or slightly curved metallic bar, with teeth on one of its edges, adapted to work into the teeth of a wheel or pinion, for the purpose of converting a circular into a rectilinear motion, or vice versa.

RACCOON, or **RACCOON**, an American plantigrade carnivorous mammal, the common racoon being the *Procyon lotor*. It is about the size of a small fox, and its grayish-brown fur is deemed valuable, being principally used in the manufacture of hats. This animal lodges in hollow trees, feeds occasionally on vegetables, and its flesh is palatable food. It inhabits North America from



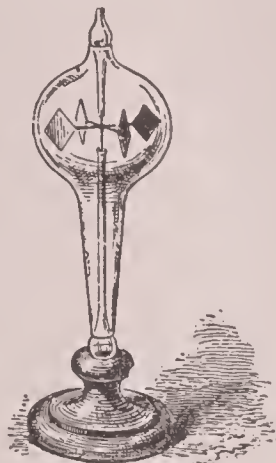
Common racoon.

Canada to the tropics. The black-footed racoon of Texas and California is *P. Hernandezii*. The agouara or crab-eating racoon is found further south on the American continent than the above species, and is generally larger. Although dominated "crab-eating," it does not appear to be any more addicted to this dietary than the common species.

RADETZ'KY, Joseph Wenceslaus, Count, a famous Austrian soldier, born at Trebnitz, in Bohemia, in 1766; died 1858. Commencing his career in a Hungarian regiment of horse in 1784, he fought in most of the campaigns in which Austria was engaged from that date up to the time of his death, including Hohenlinden, Wagram, and Leipzig. But his most signal services were in

Italy, whither he was called by the commotions following the French revolution of 1830, and where a great part of his subsequent life was spent. Radetzky was made field-marshal in 1836, and honors and rewards were showered upon him.

RADIOMETER, an instrument designed for measuring the mechanical effect of radiant energy. It consists of four crossed arms of very fine glass, supported in the centre by a needle-



Crookes' radiometer.

point, having at the extreme ends thin discs of pith, blackened on one side. The instrument is placed in a glass vessel exhausted of air, and when exposed to light the arms revolve.

RADISH, a well-known cruciferous plant. The tender leaves are used as a salad, the green pods as a pickle, and the succulent roots are much esteemed.

RADIUM, a metal in elemental form, possessing the extraordinary property of constantly emitting rays of heat and light without combustion, without chemical change of any kind, and without any apparent change in its molecular structure, was discovered and named by the French physicist, Pierre Curie and his Polish wife, in Paris, in 1898.

Imagine, if you can, an atom of radium—an infinitesimal speck, too small to be seen even with the aid of a most powerful microscope. Now imagine that this infinitesimal atom is a hollow globe and that inside this globe are 150,000 ions—each ion having room enough to fly through space at the incredible rate of speed of 20,000 miles a second, and only rarely coming in contact with another atom. An ion is the smallest division of an atom recognized by science.

Place this atom of radium, composed of 150,000 ions, in a small instrument known to scientists as a spintharoscope, which is really a powerful microscope fitted with a florescent screen. Then liberate the 150,000 ions and watch them hurl themselves with incredible force against the florescent screen. Each ion becomes a wave of light and as each ion strikes the florescent screen it explodes, giving out myriads of sparks and engendering heat.

Such an atom is radium. A piece of radium weighing a tenth part of a grain is composed of millions of atoms, and each atom in turn is made up of 150,000

ions. This tenth of a grain of radium is an active force, the myriads of ions constantly disintegrating—each ion the source of heat and light. For months, years, decades, and centuries the ions would continue to hurl themselves from that tenth part of a grain of radium, and in all those centuries the tenth of a grain would not become appreciably smaller, nor would the disintegrating process lose its power to emanate rays of heat and light.

Then, instead of a tenth of a grain of radium, imagine a pound of it—ten pounds—one hundred pounds. Even science, which pierces millions of miles of space, which estimates the myriad numbers of the stars and weighs the planets of countless solar systems, has not yet dared to place a limit on the heat and light giving power of radium in the mass.

It has been estimated that a piece of radium weighing fourteen pounds, if so great a quantity could be produced, and if all its energy could be applied mechanically, would drive a one-horsepower engine for at least 50,000 years. Thus radium, if it could only be produced in sufficient quantities, would transform night into day and do away with coal, electricity, gas, and oil. It would light streets and buildings and supply power for factories and workshops. It would revolutionize the industry of the world.

Unfortunately, radium cannot be produced except in infinitesimally small quantities. Up to the present time it has been found only in a dark, velvety mineral called pitchblende, found mostly in the Erzgebirge mountains in Austria. In 7,000 tons of pitchblende there are possibly two pounds of radium. Professor and Madame Curie laboriously



Madame Curie.

pulverized, fractionized, and washed eight tons of uranium—a metal found in pitchblende—and secured only fifteen grains of radium—say the 466th part of a pound. At that rate, the cost of producing a pound of radium would approximate \$3,000,000.

The scientific history of radium covers a scant eleven years. The investigations which led to its discovery began in 1895 with the discovery of the X-rays by Professor Roentgen. This discovery impelled scientists in all parts of the

world to begin an investigation of the mystery hidden behind the X-rays of light which has the power of passing through solid substances. The first result was produced by Prof. Henri Becquerel, a noted French physicist, who discovered that uranium emitted rays like the X-rays and which rendered a gas through which they passed a conductor of electricity.

Now, uranium was found in pitchblende, and Professor Curie and his wife, who had been extracting uranium from pitchblende and experimenting along the same lines with Professor Becquerel carried their researches still further, and in 1898 discovered radium. The discovery was made by Madame Curie herself. In experimenting with pitchblende, the chief component of which is uranium oxide, she noticed that the crude pitchblende would affect a photographic plate or discharge an electrified body much more quickly than the same weight of pure uranium salt. She therefore concluded that there was still hidden in pitchblende some element having a greater radio activity than uranium oxide. Following this conclusion, aided by her husband, she proceeded to separate the various substances of pitchblende by chemical analysis. After each separation she determined by careful experiment which of the parts contained the greater amount of radio activity. She followed this process to the end, and the discovery of radium was the result.

Naturally, the discovery created the greatest interest throughout the world. Medical science, which had been quick to adopt the X-rays in medicine and surgery, began experimenting with radium as a cure for disease. The fact that radium, when exposed to the flesh, would burn away the tissue, led to the belief that the newly discovered element might be used successfully for the eradication of cancer. The experiments so far, however, have not enabled medical science to determine with any degree of certainty the value of radium as a remedial agency.

Professor Curie, who shared with his wife the honor of discovering radium was accidentally killed in Paris on April 19, 1906. His death ended one of the most remarkable marital partnerships in the history of science. Professor Curie was 43 years old at the time of his death. His wife formerly was Miss Sklodowska, of Polish birth. When she went to Paris to complete her studies, her independent means were so small she could not matriculate at one of the big schools, and so she went to a municipal working class institute, where Professor Curie directed the laboratory. Her remarkable ability led him to make her his assistant. Their marriage followed, and they pursued their scientific researches together. Their discovery of radium made them famous in a day. In 1903 they received the Nobel prize for chemistry, and a short time later Madame Curie was awarded \$12,000 from the Osiris prize of France. Mme. Curie was appointed to succeed her husband as lecturer on physical science at the Sorbonne, this being the first instance of a woman ever being appointed to such a place in France.

RADOM, a town in Russian Poland, on the Radomka, capital of the government of the same name. It has manufactures of oil, vinegar and leather. Pop. 28,749.—The government has an area of 4768 square miles; forms the most elevated portion of the Polish plain; is much wooded; agriculture and cattle-raising the chief occupations of the inhabitants. Pop. 820,363.

RAFFLE, a game of chance, in which several persons each deposit part of the value of a thing for the chance of gaining it.

RAFFLESIA, a genus of parasitical plants. This gigantic flower, one of the marvels of the vegetable world, was discovered in the interior of Sumatra by Sir T. Raffles and Dr. Arnold. The whole plant seems to consist of little else beyond the flower and root. The perianth or flower forms a huge cup reaching a



Rafflesia Arnoldi.

width of 3 feet or more; it weighs from 12 to 15 lbs., and some of its parts are $\frac{3}{4}$ inch in thickness. It is fleshy in character and appearance, remains expanded for a few days, and then begins to putrefy, having quite the smell of carrion, and thus attracting numerous insects.

RAGNAROK (rag'na-rek), in Scandinavian mythology, literally twilight of the gods or doom of the gods, the day of doom when the present world will be annihilated to be reconstructed on an imperishable basis.

RAGOUT, meat or fish stewed with vegetables, and highly seasoned to excite a jaded appetite.

RAGS, though valueless for most purposes, are yet of great importance in the arts, particularly in paper-making. Woolen rags, not being available for paper, are much used for manure; but those of a loose texture, and not too much worn, are unraveled by means of machinery, and mixed up with good wool, to form what is known as *shoddy*, with which cheap woolen goods are made; while the refuse is pulverized and dyed various colors, to form the flock used by paper-stainers for their flockpapers.

RAHWAY, a town of the United States, in Union county, New Jersey, 20 miles s.w. of New York, on river of same name, navigable for small craft. Industries include carriage and other factories. Pop. 10,110.

RAI BARELI (rī ba-rā'lē), a town of Oudh, India, administrative headquarters of district of the same name, on the banks of the Sai, 48 miles s.e. of Lucknow. There is a bridge over the Sai, several interesting ancient structures,

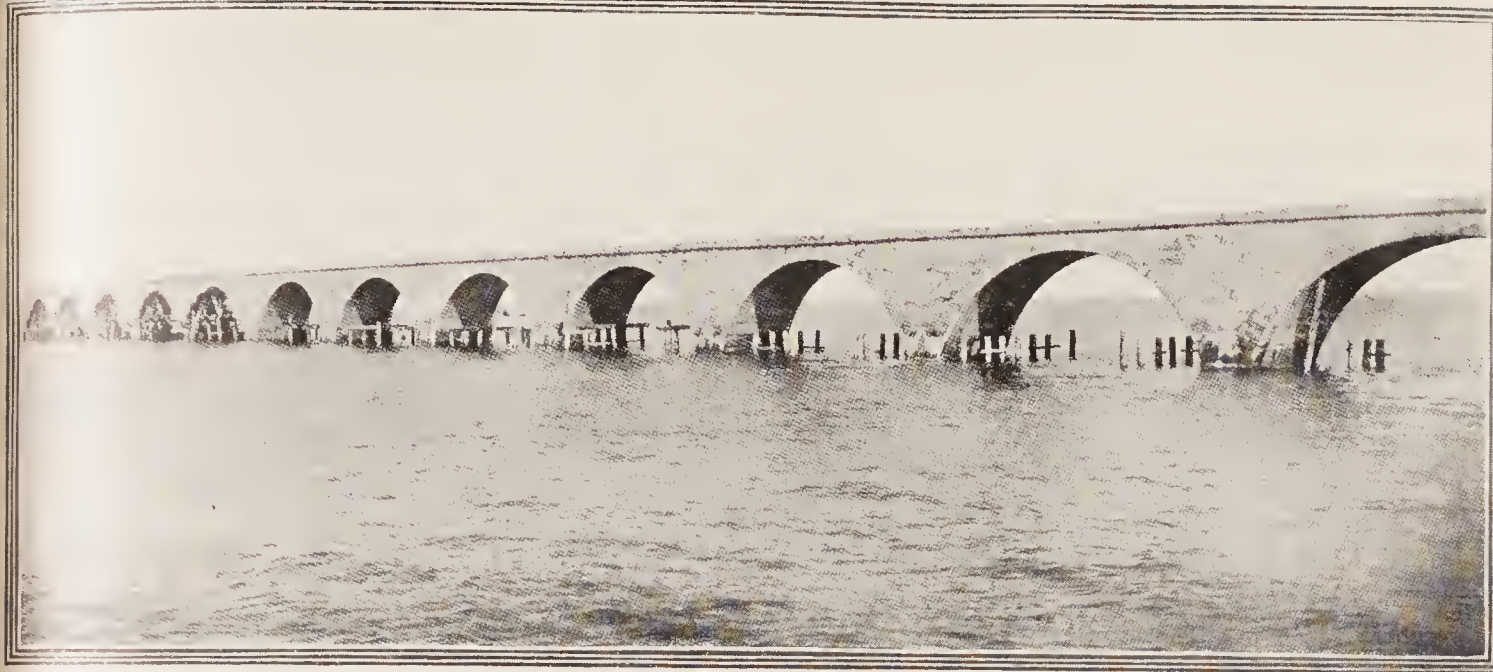
and the usual government buildings. Pop. 18,798.—The district forms part of the Lucknow division, has an area of 1751 sq. miles, and a population of 1,036,521.

RAIBOLINI (rī-bo-lē'nē), Francesco di Marco di Giacomo, usually called Francesco Francia, a famous Italian painter, engraver, medallist, and goldsmith, was born at Bologna about the middle of the 15th century, died 1533. He excelled particularly in Madonnas, and executed a number of admirable frescoes in the church of St. Cecilia at Bologna, but his most famous work is an altar-piece exhibiting the Madonna, St. Sebastian, etc., in the church of St. Giacomo Maggiore in the same city.

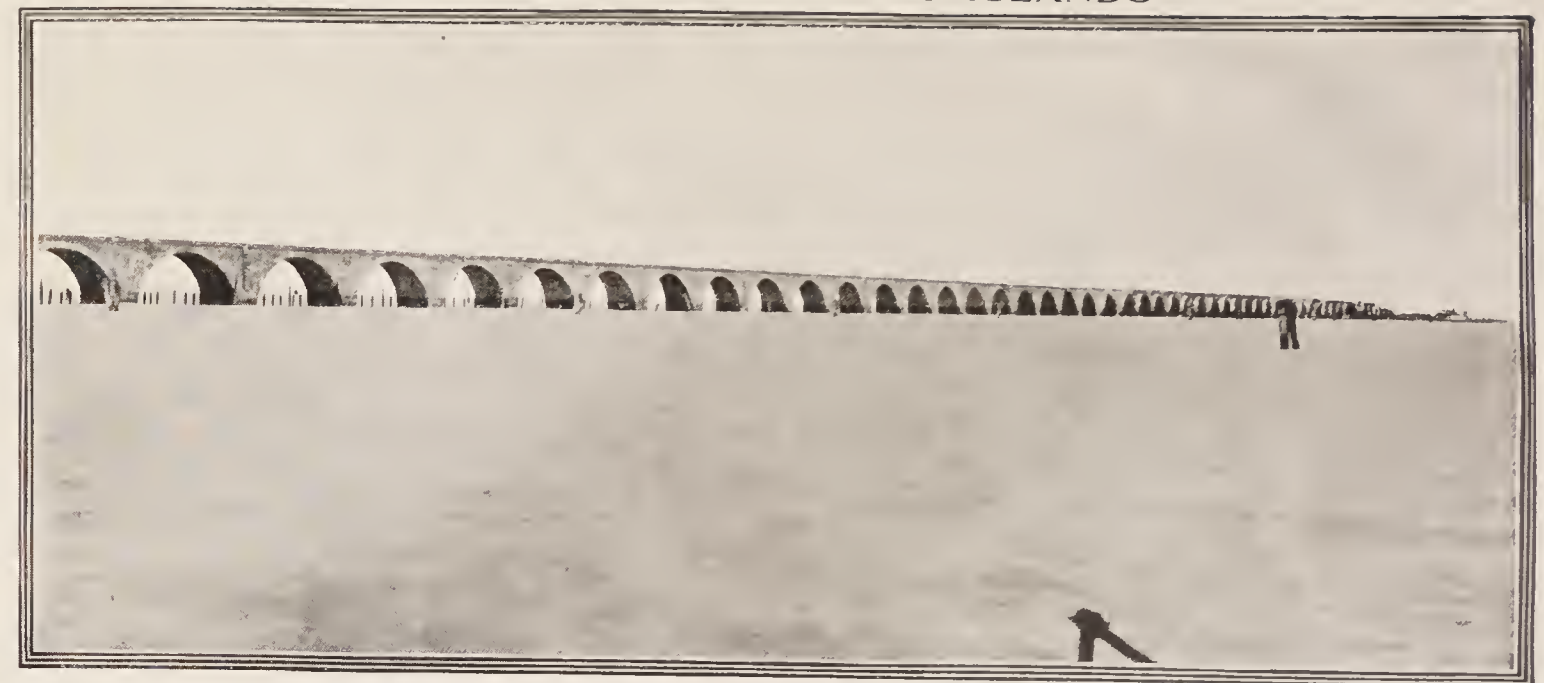
RAILWAYS, roads made by placing on the ground, on a specially prepared track, continuous parallel lines of iron or steel rails, on which carriages with flanged wheels are run with little friction and at consequent high velocities. The necessity for railways originated in the requirements of the coal-traffic of Northumberlandshire, where the first railways, formed on the plan of making a distinct surface and track for the wheels, were constructed. In 1676, near Newcastle-on-Tyne, the coals were conveyed from the mines to the banks of the river, "by laying rails of timber exactly straight and parallel; and bulky carts were made, with four rollers fitting those rails, whereby the carriage was made so easy that one horse would draw 4 or 5 chaldrons of coal." Steam-power was first used on these tram-roads early in the 18th century, but the inauguration of the present great railway system dates from 1821, when an act was passed for the construction of the Stockton and Darlington railway, which was opened in 1825. The United States of America quickly followed Britain in railway construction, and between 1830 and 1833 railways were rapidly opened in the states. Horse railroads extending to a considerable length were in existence before 1830. There was no development of the railway system in France till about 1842, when several great lines were established; Belgium and the Netherlands followed, but Germany, Austria, and Russia were somewhat behind the western European nations in their railway development.

The modern railway consists of one or more pairs of parallel lines of iron or steel bars, called rails, these bars joining each other endwise, and the parallel lines being several feet apart. The width between the rails is called the gauge. What is known as the national or standard gauge, used in Britain and the greater part of Europe, and formerly called the narrow gauge, measures 4 feet 8½ inches between the rails; the broad gauge (now gone out of use) being 7 feet. It is believed to have originally represented the width suitable for the coal wagons of the North of England, and has been found on the whole very satisfactory. In Ireland the gauge is 5 feet 3 inches, in India 5 feet 6. Narrower gauges are used in certain special lines; and in the United States the standard gauge is 4 feet 8½ inches. A pair of parallel lines of rails constitutes a single track of railway, two pairs a double line, and so on. The

A RAILROAD ACROSS THE SEA—AN ASTONISHING ENGINEERING FEAT CONNECTING FORTY-TWO ISLANDS



Part of the Florida east coast railway Viaduct across the sea



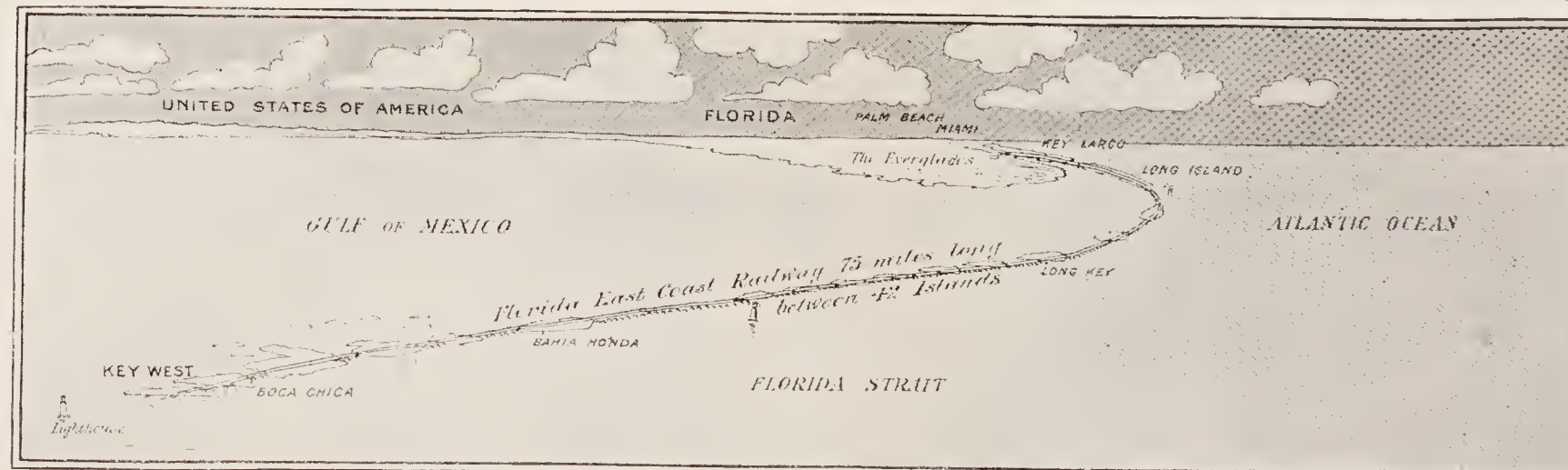
Part of the seven-mile Viaduct at Long Key, consisting of 186 arches

LINKING UP THE REMOTE—A RAILWAY ACROSS THE SEA

A very daring railway feat is now well under way in the southernmost part of the United States. It will form an extension of the Florida east coast railway. When completed it will carry passengers direct from New York to Key West without change. This is being accomplished by virtually allowing a line to go to sea at a point below Miami on the east coast of Florida. It then crosses seventy-five miles of open water by bridge or viaduct traversing no fewer than 42 islands or keys before its destination is reached.

Much of the land which the railway will cross consists of an almost impenetrable swamp. Although a single track the engineers estimate that the cost of construction will exceed \$100,000 a mile or about \$15,000,000 for the 150 miles of construction from Miami to Key West. One of the most interesting parts of the work to the lay mind is the precautions taken to safeguard the exposed viaducts against the sea.

The viaducts are being built of reinforced concrete resting either on deep piling or solid rock. It has been found



How the extensions of the Florida east coast railway proceed seventy-five miles to sea and links up forty-two islands

after careful examination that the maximum height of waves throughout this region is twenty-five feet and the railway bed is being built at a level of more than thirty feet above high tide.

This longest of viaducts over the open sea will be nearly seven miles long, and will consist of 186 arches. Of these 70 are already completed. The supports of each of the arches rests upon 28 piles driven deep into the coralline limestone, which forms the bed of the sea. After the pile drivers have passed to the next pier, a cofferdam is lowered from a catamaran into place around the piles. A long pipe is then used to lay concrete to a depth of three feet. As soon as this has hardened the water is pumped out and the pier forms are set in place around the piles, which have been cut down to low water level. A great barge containing the cement-mixing machine is then towed into place and cement is poured in. It is allowed to stand for three weeks before the frame is removed. When completed the viaduct consists of a thick shell of cement, which is in turn filled with earth and crushed rock to the track level. The water varies in depth from thirteen to twenty feet. The tide under normal conditions flows at the rate of four miles an hour.



The Arch Frames under Construction. Two of the low islets can be seen in the distance

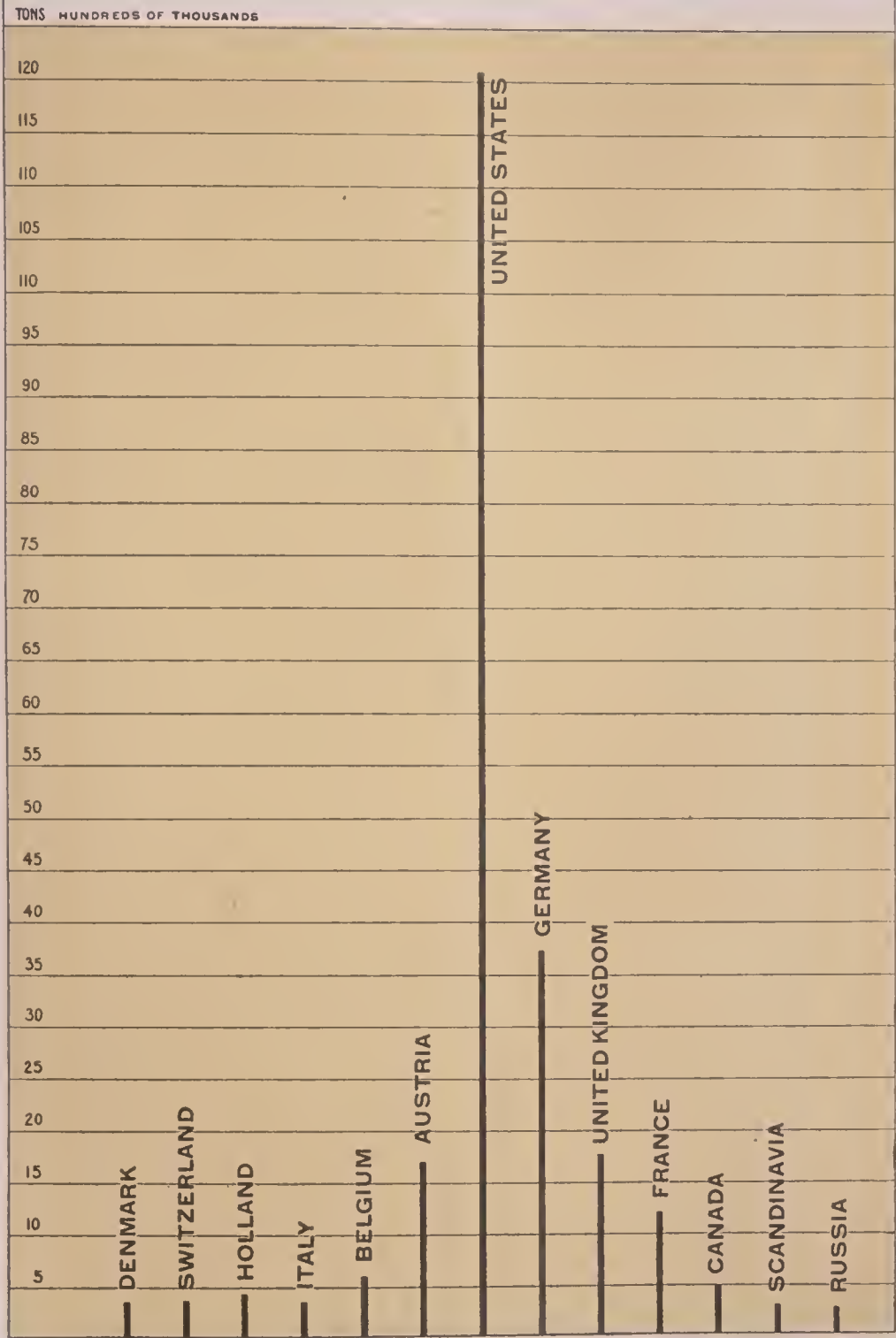


A Completed Portion of the Viaduct—The Railway Track is thirty feet above high tide. The waters of the Gulf of Mexico and the Atlantic mingle beneath the arches

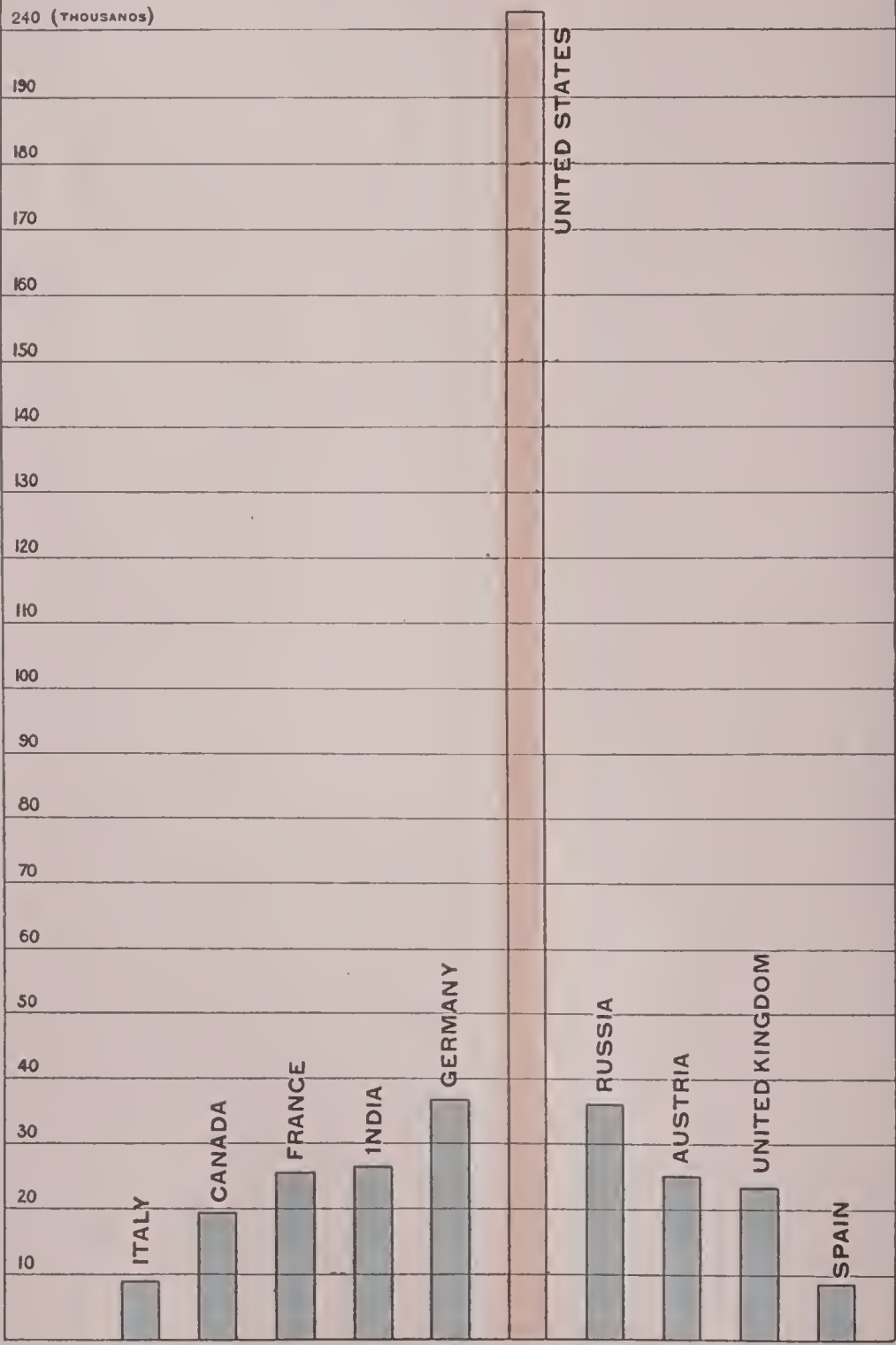


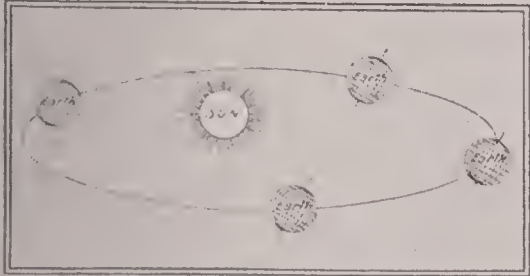
How the Piers are Constructed of reinforced concrete. The metal rods are completely imbedded when the arch is finished

RAILROADS OF THE WORLD—1909
FREIGHT TONNAGE

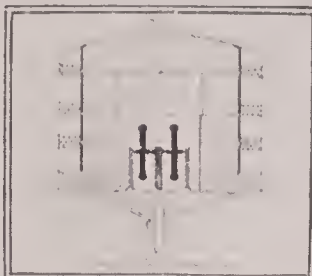


RAILWAY MILEAGE OF THE NATIONS—1909

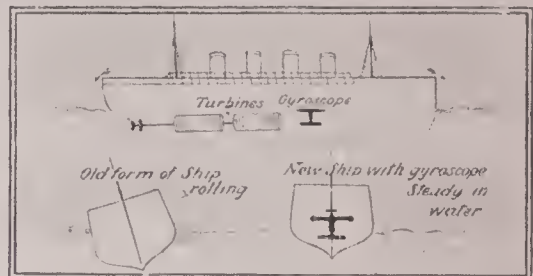




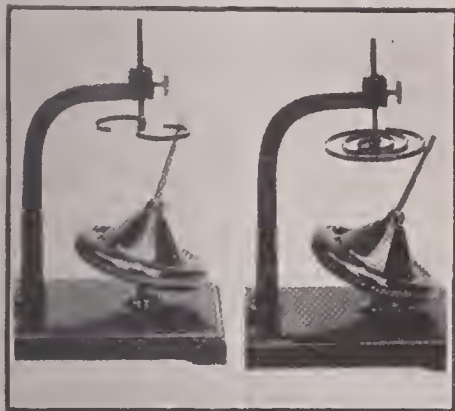
The Gyroscope in the Heavens



How the Future Railway Carriage will Stand Erect



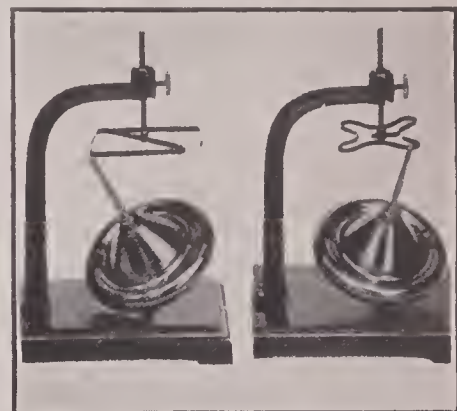
The Turbine as a Steadying Apparatus



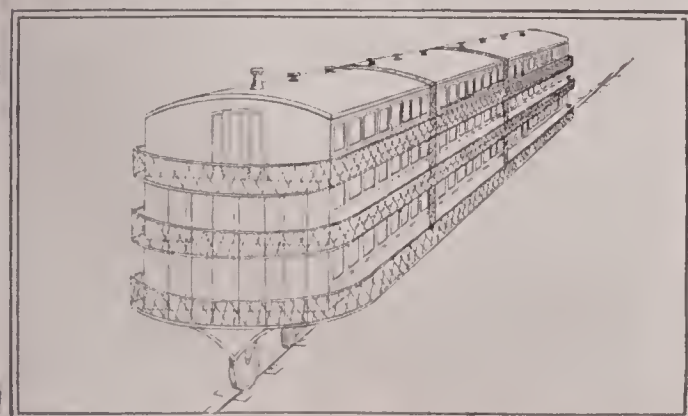
The Principle of the New System



The Brennan Monorail Track



The Power on which the New System Relies



The Huge Railway Carriages of the Future



The Single-line Railway of the Future



In the Newest Railway Carriage



The Brennan Experimental Monorail Carriage and its Single Rail—The Wire is used as a Bridge

The new method of locomotion which promises to revolutionize railway travel. It is rendered possible by an application of the gyroscope. The cars remain erect on one rail, owing to two rapidly rotating flywheels which resist being moved out of their plane of rotation. Future railway carriages on trunk lines will be of much larger dimensions than at the present time, speeds will be from two to three times greater, and accidents will be almost impossible.

RAILROAD SPEED NOTABLE FAST RUNS OF PASSENGER TRAINS FOR LONG DISTANCES.

DATE	Railroad	Terminals	Distance Miles	INCLUSIVE	
				Time H.M.	Miles per Hour
May, 1848.	Great Western (England).....	London—Didcot.....	53.25	0.47	68
July, 1885.	Westshore.....	East Buffalo—Frankfort.....	201.7	4.00	50.4
Aug., 1888.	London, N. W. & Caledonian.....	London—Edinburgh.....	400	7.38	52.4
Aug., 1894.	Plant System, Atlantic Coast Line	Jacksonville—Richmond.....	661.5	12.51	51.48
April, 1895.	Pennsylvania.....	Camden—Atlantic City.....	58.3	0.45½	76.50
Aug., 1895.	London & Northwestern.....	London—Aberdeen.....	540	8.32	63.28*
Sept., 1895.	New York Central & H. R.....	New York—Buffalo.....	436.50	6.47	64.33*
Sept., 1895.	New York Central "World Flyer"	Albany—Syracuse.....	148	2.10	68.3
Feb., 1897.	Chicago, Burlington & Quincy.....	Chicago—Denver.....	1,025	18.52	58.74
April, 1897.	Lehigh Val., Black Diamond Exp.	Alpine, N. Y.—Geneva Jc., N. Y.	43.96	0.33	80
Aug., 1897.	Union Pacific.....	North Platte—Omaha.....	291	4.39	63.49
May, 1900.	Burlington Route.....	Burlington—Chicago.....	205.8	3.08½	65.5†
Mar., 1902.	Burlington Route.....	Eckley—Wray.....	14.8	0.9	98.7
Aug., 1902.	"20th Century Ltd." on L. Shore.....	Kendallville—Toledo.....	91	1.15	72.8
Mar., 1903.	Atlantic Coast Line.....	Jacksonville—Savannah.....	172	2.32	70.7
May, 1903.	"20th Century Ltd." on L. Shore.....	Toledo—Elkhart.....	133.4	1.54	70.2
July, 1903.	Great Western (England).....	London—Plymouth.....	246	3.54	63.13
April, 1904.	Michigan Central.....	Niagara Falls—Windsor.....	225.66	3.11½	70.74
July, 1904.	Great Western (England).....	Paddington—Bristol.....	118.5	1.24	84.6
Nov., 1904.	Pennsylvania.....	Crestline—Fort Wayne.....	131	1.53	69.56
June, 1905.	Pennsylvania.....	Chicago—Pittsburgh.....	468	7.20	63.53*
June, 1905.	Lake Shore & Mich. Southern.....	Buffalo—Chicago.....	525	7.50	69.69†
June, 1905.	Pennsylvania.....	New York—Chicago.....	897	16.3	56.07
June, 1905.	New York Central.....	Chicago—New York.....	960.52	15.56	60.28†
July, 1905.	Pennsylvania.....	Washington, O.—Fort Wayne.....	81	1.4	75.84
Oct., 1905.	Pittsburgh, Ft. Wayne & C.....	Crestline, O.—Clark Junc., Ind.	257.4	3.27	74.55

* Including stops. † Excluding stops.

rails are supported at a little height above the general surface by iron pedestals called chairs, which again are firmly fixed to wooden or iron (sometimes stone) supports called ties, placed at intervals and embedded in the material of the roadway. A railway, in general, approaches as nearly to a straight line between its two extremes as the nature of the country and the necessities of the intermediate traffic will permit. It is carried over valleys, either by embankments or viaducts, and through hills or elevated ground by deep trenches called cuttings, or by tunnels. In favorable cases the surface line of the railway is so adjusted that the materials excavated from the cuttings will just serve to form the embankments. Should the excavated material be in too small quantity to form the embankment, recourse is had to an excavation along the sides of the site of the latter to supply the deficiency. The line of railway can seldom run for any distance on a level, and its various slopes are termed gradients, the arrangements of the rises and falls being termed the grading of the line. A more or less steep ascent is termed an incline. When the line is formed its surface is covered with broken stones or clean gravel called ballasting, and in this the sleepers for sustaining the chairs and rails are embedded. The wooden ties are laid across the roadway about 3 feet apart from center to center, and to them the chairs which sustain the rails are spiked. Sometimes longitudinal wooden ties are used along with the transverse ties. These consist of beams laid under the rails and secured to the transverse ties. When such are used chairs are frequently dispensed with, the rails being formed with a flange at bottom which is fastened directly to the wooden beam. When the railway track is thus completed the work is called the permanent way, and it furnishes the route over which carriages or cars, wagons, vans, etc., are dragged by a locomotive engine,

a number of these vehicles forming a train.

In the railway of a single line of rail it is necessary to make provision for permitting meeting engines or carriages to pass each other by means of sidings, which are short additional lines of rail laid at the side of the main line, and so connected with it at each extremity that a carriage can pass into the siding in place of proceeding along the main line. In double lines, in addition to sidings, which are in them also required at many places, it is necessary to provide for carriages crossing from one line of rails to another. This change in the direction of the carriage is effected by switches. Switches or points are short movable rails close to the main rails connected by rods to suitable handles, the extremities of these short rails being formed so as to guide the flanges of the wheels of a carriage from one line of rail to another. Switches are usually coupled or interlocked with the signals or signalling apparatus, so necessary for properly carrying on the traffic—coupled when they are moved simultaneously with the signals, interlocked when the necessary movement of the switches is completed before the signal is moved. Signalling is effected by means of semaphores in daylight and lights of three colors, white, green, or blue, and red, at night. The telegraph is also used in regulating the traffic. (See Block System.) The various places along the line of railway, where railway trains stop for taking up or depositing goods or passengers are termed depots, with the prefix of freight or passenger, as they are allotted to the one or the other; the stations at the extremities of a railway are called terminals.

The mode in which the locomotive acts in moving the cars is that by its weight and the friction of its wheels on the rails a tractive force is provided sufficient to enable it to move at a high rate of velocity, and to drag great loads

after it. In some particular cases a fixed engine is employed to give motion to a rope by which the cars are dragged along, the rope being either an endless rope stretched over pulleys, or one which winds and unwinds on a cylinder. Such engines are termed stationary engines, and are used chiefly on inclined planes, where the ascent is too steep for the locomotive engine. In some cases the cars are impelled by atmospheric pressure, and in some few cases by electricity. (See Atmospheric Railway, Electric Railway.) The locomotives, passenger cars, freight cars or trucks, vans, etc., constitute the rolling stock of a railway. For the sake of uniformity, externally and in many of the details, the cars are usually made of the same external length width, and height, and suitably in the interior. The underworks of the cars may thus be identical in construction, and a uniformity of working and wearing parts is thus secured, which is conducive to economy of maintenance. They are usually from 40 to 60 feet long with a center passage, the doors being at the ends—with the seats arranged transversely on each side. At platform at the end enables a person to go from end to end of the train. There is generally but one class of passengers, but on long journeys Pullman and other sleeping-cars are used at extra fares. The average speed of express passenger trains in the United States is about 60 miles an hour for the express trains and from 30 to 40 miles an hour for the regular local trains; express freight trains from 20 to 25 miles. Railways for the local service of large cities are usually partly or wholly underground, as in the London Metropolitan railway, the New York Central and Hudson River R. R., or elevated above the street traffic, as in New York and Chicago.

Some of the tunnels, bridges, and viaducts constructed in connection with railways are among the engineering triumphs of the age. Of the former the most notable are those of Mt. Senis, the St. Gothard, and the Airlberg tunnel in the Alps; the Severn tunnel, and the Mersey tunnel in England, and the Hoosac tunnel in Massachusetts. The greatest of the railway bridges are those over the Forth and the Tay in Scotland; the Britannia tubular bridge over the Menai straits, North Wales; the Victoria bridge, Montreal; the New York and Brooklyn Suspension bridge. There are many stone viaducts of great length. The Congleton viaduct, on the Manchester and Birmingham railway, is perhaps the longest in England; it is 1026 yards long and 106 feet high. An iron viaduct 2½ miles long connects the city of Venice with the mainland.

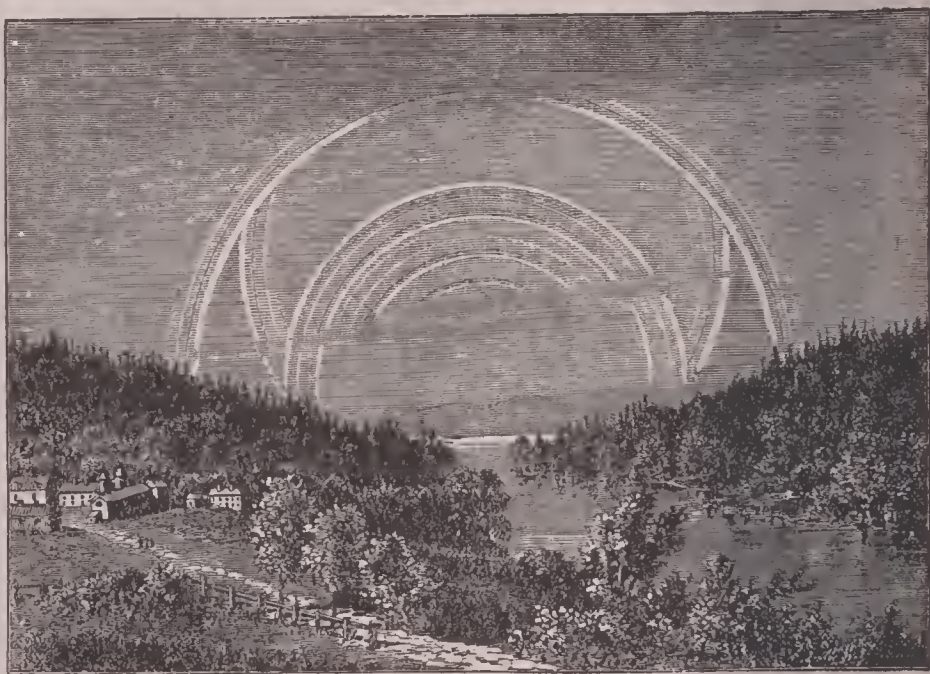
The use of sleeping cars and parlor cars introduced an element of comfort in railway travel which was of great importance in this country, on account of the distance traversed. The buffet car was afterward provided to avoid delays at meal stations. Dining cars, introduced shortly afterward, led to the development of vestibuled trains. Vestibuled express trains are now in general use, on which sleepers, parlor cars, a dining car, a smoking saloon, library, bath-room, barber-shop, and writing-

room are provided. In the United States between four and five thousand passengers are killed and injured each year by railway accidents. These figures seem large until the enormous number of passengers carried safely to one injured is calculated. According to the report of the interstate commerce commission, 2,316,648 passengers were carried safely in 1900 to one passenger killed, and 139,740 passengers were carried safely to one injured. In England in 1900 the proportion was one passenger killed in 8,461,309 and one injured in 470,848. On the continent of Europe in many cases an even better record is maintained. The total mileage in the United States at the close of 1905 was 212,624, the capital stock \$6,741,956,825, the bonded debt \$7,821,243,105, gross earnings \$2,112,197,770, the net earnings \$685,464,488.

RAIN, the water that falls from the heavens. Rain depends upon the formation and dissolution of clouds. The invisible aqueous vapor suspended in the atmosphere, which forms clouds, and is deposited in rain, is derived from the evaporation of water, partly from land, but chiefly from the vast expanse of the ocean. At a given temperature the atmosphere is capable of containing no more than a certain quantity of aqueous vapor, and when this quantity is present the air is said to be saturated. Air may at any time be brought to a state of saturation by a reduction of its temperature, and if cooled below a certain point the whole of the vapor can no longer be held in suspension, but a part of it condensed from the gaseous to the liquid state will be deposited in dew or float about in the form of clouds. If the temperature continues to decrease the vesicles of vapor composing the cloud will increase in number and begin to descend by their own weight. The largest of these falling fastest will unite with the smaller ones they encounter during their descent, and thus drops of rain will be formed of a size that depends on the thickness, density, and elevation of the cloud. The point to which the temperature of the air must be reduced in order to cause a portion of its vapor to form clouds or dew is called the dew-point. The use of the spectroscope has become to some extent a means of anticipating a fall of rain, since when light that has passed through aqueous vapor is decomposed by the spectroscope a dark band is seen (the rain-band), which is the more intense the greater the amount of vapor present. The average rainfall in a year at any given place depends on a great variety of circumstances, as latitude, proximity to the sea, elevation of the region, configuration of the country and mountain ranges, exposure to the prevailing winds, etc. When the vapor-laden atmosphere is drifted toward mountain ranges it is forced upward by the latter, and is consequently condensed, partly by coming into contact with the cold mountain tops, and partly by the consequent expansion of the air due to the greater elevation. The presence or absence of vegetation has also considerable influence on the rainfall of a district. Land devoid of vegetation has its soil intensely

heated by the fierce rays of the sun, the air in contact with it also becomes heated, and is able to hold more and more moisture, so that the fall of rain is next to impossible. On the other hand, land covered with an abundant vegetation has its soil kept cool, and thus assist in condensation. Although more rain falls within the tropics in a year, yet the number of rainy days is less than in temperate climes. Thus in an average year there are 80 rainy days in the tropics, while in the temperate zones the number of days on which rain falls is about 160. At the equator the average yearly rainfall is estimated at 95 inches. At a few isolated stations the fall is often very great. At Cherrapunjee, in the Khasia Hills of Assam, 615 inches fall in the year, and there are several places in India with a fall of from 190 to 280 inches. In Britain, Skye, and a large portion of the mainland to the s.e. as far as Loch Lomond, the greater part of the lake district of Northern

primary, and the outer the secondary rainbow. Each is formed of the colors of the solar spectrum, but the colors are arranged in the reversed order, the red forming the exterior ring of the primary bow, and the interior of the secondary. The primary bow is formed by the sun's rays entering the upper part of the falling drops of rain, and undergoing two refractions and one reflection; and the secondary, by the sun's rays entering the under part of the drops, and undergoing two refractions and two reflections. Hence, the colors of the secondary bow are fainter than those of the primary. Rainbows are sometimes produced by the sun's rays shining on the spray of cascades, fountains, etc., and then a whole circle can frequently be seen. A broken rainbow mostly occurs from the field not being filled with falling rain, but it will also happen when the sun is invisible from part of the field. The moon sometimes forms a bow or arc of light, more faint than that formed by



Non-concentric rainbow observed in Sweden in 1875.

England, and the mountainous parts of Wales have an average of 80 inches and upward (the highest, 128.50 inches at Glencoe in Argyleshire). The s.e. of England has the smallest, 22.50 to 25 inches. The rainfall at Paris is 22 in.; New York, 43 in.; Washington, 41 in.; San Francisco, 22 in.; Sitka, Alaska, 90 in.; Honduras, 153 in.; Maranhao, 280 in.; Singapore, 97 in.; Canton, 78 in.; New South Wales, 46 in.; South Australia, 19 in.; Victoria, 30 in.; Tasmania 20 in.; Cape Colony, 24 in. The greatest annual rainfall hitherto observed seems to be on the Khasia Hills.

RAINBOW, a bow, or an arc of a circle consisting of all the prismatic colors, formed by the refraction and reflection of rays of light from drops of rain or vapor, appearing in the part of the heavens opposite to the sun. When the sun is at the horizon the rainbow is a semicircle. When perfect the rainbow presents the appearance of two concentric arches; the inner being called the

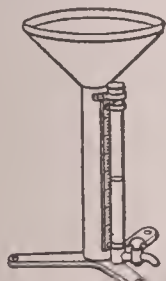
the sun, and called a lunar rainbow. A spurious or supernumerary rainbow is a bow seen in connection with a fine rainbow, lying close inside the violet of the primary bow, or outside that of the secondary one. Its colors are fainter and more impure, as they proceed from the principal bow, and finally merge into the diffused white light of the primary bow, and outside the secondary.

Non-concentric bows have been seen at various times during the last two hundred years. One of the most perfect was observed by Halley, the astronomer, on August 6, 1698. It appears to have been a very perfect specimen of a non-concentric bow, extending in an unbroken arch from the feet of the inner bow to the summit of the outer or secondary bow. The order of colors in this non-concentric bow was the same as in the primary; so that where it appeared to overlap the secondary bow there was a portion of a white arch. Perhaps one of the most remarkable

cases is that represented in our illustration, in which it will be noted that between the ordinary inner and outer bows there are the legs of a bow non-concentric with both. This splendid sight was seen at Nya, Kopparberg, in Sweden, by M. Gumælius, on June 19, 1875, and it is remarkable that similar bows have been recorded in Sweden on several occasions. In this case, besides the non-concentric bow, several supplementary concentric bows were seen, as shown in the engraving.

Other wonderful rainbows, or, perhaps more correctly, mist-bows, have been seen on rare occasions. Aëronauts and mountaineers have observed them of a completely circular form, when they have happened to be in elevated positions. A somewhat similar phenomenon is sometimes observed by the boatmen of Lake Superior when there is a low-lying fog on the water, and a brilliant sun overhead. On such occasions an iridescent halo surrounds the shadow of the observer's head, but is generally of a simply circular form.

RAIN-GAUGE, or PLUVIOMETER, an instrument used to measure the quantity of rain which falls at a given place. They are variously constructed. A convenient form (shown in figure) consists of a cylindrical tube of copper, with a funnel at the top where the rain enters. Connected with the cylinder at the lower part is a glass tube with an attached scale. The water which enters the funnel stands at the same height in



Rain-gauge.

the cylinder and glass tube, and being visible in the latter the height is read immediately on the scale, and the cylinder and tube being constructed so that the sum of the areas of their sections is a given part, for instance a tenth of the area of the funnel at its orifice, each inch of water in the tube is equivalent to the tenth of an inch of water entering the mouth of the funnel. A stop-cock is added for drawing off the water. A simpler form of gauge consists of a funnel having at the mouth a diameter of 4.697 inches, or an area of 17.33 sq. inches. Now, as a fluid ounce contains 1.733 cubic inches, it follows that for every ounce fluid collected by this gauge the tenth of an inch of rain has fallen. Recently-constructed automatic gauges give a continuous record of rainfall; indicate the duration of each shower, the amount of rain that has fallen, and the rate at which it fell.

RAIN-TREE, a leguminous tree of tropical America, now largely planted in India for the shade it furnishes, and because it flourishes in barren salt-impregnated soils, as well as for its sweet pulpy pods, which are greedily eaten by cattle.

RAIPUR (ri-pör'), a town of India, headquarters of district of same name in the Chhatisgarh division, Central provinces. Pop. 32,114.—The district includes within its limits four small feudatory states; area, 11,724 sq. miles; pop. 1,422,778.

RAISINS, the dried fruit of various species of vines, comparatively rich in sugar. They are dried by natural or artificial heat. The natural and best method of drying is by cutting the stalks bearing the finest grapes half through when ripe, and allowing them to shrink and dry on the vine by the heat of the sun. Another method consists of plucking the grapes from the stalks, drying them, and dipping them in a boiling lye of wood-ashes and quick-lime, after which they are exposed to the sun upon hurdles of basket-work. Those dried by the first method are called raisins of the sun or sun-raisins, muscatels, or blooms; those by the second, lexias. The inferior sorts of grapes are dried in ovens. Raisins are produced in large quantities in the south of Europe, Egypt, Asia Minor, California, etc. Those known as Malagas, Alicantes, Valencias, and Denias are well-known Spanish qualities. A kind without seeds, from Turkey, are called sultanas. The Corinthian raisin, or currant, is obtained from a small variety of grape peculiar to the Greek Islands.

RAJAH, or RAJA, in India, originally a title which belonged to those princes of Hindu race, who, either as independent rulers or as feudatories, governed a territory; subsequently, a title given by the native government to Hindus of rank. It is now not unfrequently assumed by the zemindars or landholders, the title Mahârâjah (great rajah) being generally reserved to the more or less powerful native princes.

RAJPIPLA, native state of India, in Bombay presidency, watered by the Nerbudda. Area, 1514 sq. miles; pop. 114,756; capital Nandod.

RAJPUTA'NA, a large province of India, under the suzerainty of Britain since 1817, in the west part of Hindustan proper, extending from the Jumna and Chumbul rivers, west to Sind and Bhawalpur, and comprising the greater part of the Indian desert. It includes the British district of Ajmere-Merwara and twenty autonomous states, each under a separate chief; has a total area of 127,541 sq. miles, and a pop. of 9,723,301, exclusive of a considerable Bheel population, estimated at 230,000.

RAJSHAHI, a division or commissionership of Bengal, extending from the Ganges to Sikkim and Bhutan. Area, 17,428 sq. miles; pop. 8,019,187.—The district of Rājshāhi, forming part of the division, has an area of 2361 sq. miles; a pop. of 1,460,644. Capital of division and district Rāmpur Beaulah.

RAKE, an implement which in its simplest form consists merely of a wooden or iron bar furnished with wooden or iron teeth, and firmly fixed at right angles to a long handle. In farming it is used for collecting hay, straw, or the like, after mowing or reaping; and in gardening it is used for smoothing the soil, covering the seed, etc. Large rakes for farm work are

adapted for being drawn by horses; and there are many modifications both of the hand-rake and the horse-rake.

RALEIGH (ral'i), the capital of North Carolina, near the center of the state. Among the principal public buildings are the state-house with a handsome



Horse-rake.

columned front, the court-house, and post-office, all in granite. It is an important cotton center, and the industries are various. Pop. 15,940.

RALEIGH (ral'i), or **RALEGH**, Sir Walter, navigator, warrior, statesman, and writer in the reigns of Elizabeth and James I. In 1584 he obtained a charter of colonization and unsuccessfully attempted the settlement of Virginia in one or two following years. In 1584, also, he obtained a large share of the forfeited Irish estates, and introduced here the cultivation of the potato. In 1588 he rendered excellent service against the Spanish Armada, and subsequently vessels were fitted out by him to attack the Spaniards. To discover the fabled El Dorado or region of gold he planned an expedition to Guiana, in which he embarked in 1595, and reached the Orinoco; but was obliged to return after



Sir Walter Raleigh.

having done little more than take a formal possession of the country in the name of Elizabeth. In 1596 he held a naval command against Spain under Lord Howard and the Earl of Essex, and assisted in the defeat of the Spanish fleet and the capture of Cadiz. Next year he captured Fayal in the Azores; in 1600 he became governor of Jersey. James I., on his accession in 1603, had his mind soon poisoned against Raleigh, whom he deprived of all his offices. Accused of complicity in Lord Cobham's treason in favor of Arabella Stuart, Raleigh was brought to trial at Winchester in November 1603, found guilty of treason, and sentenced to death. He was, however, reprieved and confined

in the tower. Here he remained for twelve years, devoting himself to scientific and literary work. In 1616 he obtained his release by bribing the favorite Villiers, and by offering to open a mine of gold which he believed to exist near the Orinoco. The enterprise proved disastrous. Raleigh's force had attacked the Spaniards, and on his return James, to favor the Spanish court, with his usual meanness and pusillanimity determined to execute him on his former sentence. After a trial before a commission of the privy-council the doom of death was pronounced against him, and was carried into execution October 29, 1618.

RAM, a steam iron-clad ship-of-war, armed at the prow below the water-line with a heavy iron or steel beak intended to destroy an enemy's ships by the force with which it is driven against them. The beak is an independent adjunct of the ship, so that, in the event of a serious collision, it may be either buried in the opposing vessel or carried away, leaving uninjured the vessel to which it is attached. By naval experts the ram is considered as a main element in the solution of the problem of coast defense.

RAMEE, Louise de la (Ouida), English novelist of French extraction, born at Bury St. Edmunds, 1840, has latterly lived much in Italy. She published her first novel, "Held in Bondage," in 1863, and since then has been a very prolific writer. Among her best works are Strathmore, Chandor, Puck, Moths, Princess Napraxine, A House Party, Gilderoy, etc. She died in 1908.

RAM'ESSES, or **RAMSES** (in Egyptian, "the Child of the Sun"), the name given to a number of Egyptian kings.—Rameses I. was the first king of the nineteenth dynasty, and was not among the most remarkable of the series.—Rameses II., grandson of the preceding, was the third king of the nineteenth dynasty, and was born in the quarter of a century preceding the year 1400 B.C. He is identified by many with the Sesostris of Greek writers. (See Sesostris.) His first achievement was the reduction of Ethiopia to subjection. He defeated a confederation among whom the Khita or Hittites were the chief in a great battle near the Orontes in Syria, and in a subsequent stage of the war took Jerusalem and other places. He was a zealous builder and a patron of art and science. He is supposed to have been the king who oppressed the Hebrews, and the father of the king under whom the exodus took place.—Rameses III., the Rhampsinitus of Herodotus, belonged to the twentieth dynasty, and was uniformly successful in war. He endeavored to surpass his ancestors in the magnificence of his buildings.

RAM'ESSES, one of the treasure-cities of Egypt built by the Hebrews during the oppression, and probably named after Rameses II. It has been identified by Lepsius with Tell-el-Maskhûta on the Fresh-water canal (about 12 miles west of the Suez canal), and by Brugsch with Tanis the modern San.

RAMPANT, in heraldry, standing upright upon its hind-legs (properly on one foot) as if attacking; said of a beast of prey, as the lion. It differs from salient,

which means in the posture of springing forward. Rampant gardant is the same as rampant, but with the animal looking full-faced. Rampant regardant is



Rampant.



Rampant gardant.

when the animal in a rampant position looks behind.

RAMPART, in fortification, an elevation or mound of earth round a place, capable of resisting cannon-shot, and on which the parapet is raised. The rampart is built of the earth taken out of the ditch, though the lower part of the outer slope is usually constructed of masonry. The term in general usage includes the parapet itself.

RAMPUR', capital of a native state of the same name, in the United Provinces of India, on the left bank of the Kosila river, 18 miles e. of Moradabad. Pop. 78,758.—The state, which is under the political superintendence of the government of the United Provinces, has an area of 899 sq. miles and a pop. of 532,067.

RANDALL, Samuel Jackson, American political leader, was born in Philadelphia, Pa., in 1828. In 1858 he was elected a member of the state senate. In November, 1862, he was elected to represent the First Pennsylvania district in congress, to which he was thirteen times successively reelected. In the Forty-third congress (1873-75) by directing the democratic opposition to the "Force Bill" he was recognized as the leader of his party in the house. In December, 1876, he was elected to succeed Speaker Kerr, who had died during the recess of congress. He was reelected speaker of the Forty-fifth and Forty-sixth congresses (1877-81). At the democratic national convention of 1880 he received 128½ votes on the second ballot for the nomination to the presidency. In his last two elections to congress he was unopposed by the republicans. He died in 1890.

RANDOLPH, Edmund Jennings, an American statesman, was born in Williamsburg, Va., in 1753. In August, 1775, he became one of Washington's aides, and in 1776 sat in the Virginia constitutional convention. He was the first attorney-general under the new state constitution (1776), sat in the continental congress from 1780 to 1782, and was governor of Virginia from 1786 to 1788. In 1789, he was appointed by Washington attorney-general of the United States. On January 2, 1794, he succeeded Jefferson as secretary of state, but resigned in August, 1795. Returning to his home, he became the leader of the Virginia bar, and in 1807 helped defend Aaron Burr against the charge of treason. He died in 1813.

RANDOLPH, John, of Roanoke, American statesman, was born at Cawsons in Chesterfield co., Va., in 1773. In 1799 he was elected to congress and became the democratic-republican leader of the house of representatives. He

opposed the war of 1812, and the Missouri compromise, and stigmatized the northern members who voted for the latter as "doughfaces." In 1822 and 1824 he visited England. In 1825 he began his two years' service as senator from Virginia, and fought his famous



John Randolph

duel with Henry Clay. In 1830 he was appointed minister to Russia. He died in 1833.

RANGE, in gunnery, the horizontal distance to which a shot or other projectile is carried. When a cannon lies horizontally it is called the point-blank range; when the muzzle is elevated to 45 degrees it is called the utmost range. To this may be added the ricochet, the skipping or bounding shot, with the piece elevated from 3 to 6 degrees. Several instruments have been invented for the purpose of finding the range or distance or objects against which guns are to direct their fire, being known as range-finders or telemeters. They generally depend on trigonometrical principals and on the use of telescopes.

RANGE-FINDER, an instrument used to determine the horizontal distance of the object to be hit from the gun which is firing. They are of three types, those furnishing their own bases for measurement, those depending upon a known dimension of the object aimed at, and those utilizing a time observation. The first-named type have the most general application, but satisfactory instruments are either very cumbersome or delicate, or are liable to give ranges considerably in error.

RANGOON', the capital of Lower Burmah, and the chief seaport of Burmah, is situated at the junction of the Pegu, Hlaing or Rangoon, and Pu-zundoung rivers, about 21 miles from the sea. Since its occupancy by the British in 1852 Rangoon has undergone such changes that it is practically a new town, and its population has increased five-fold. Pop. 234,881. Of the population about 100,000 are Buddhists) Burmese) and 60,000 Hindus.

RANGPUR', a district in the Rajshahi division of Bengal; area, 3486 sq. miles. This territory is flat and well-watered, the chief product being rice. Pop. 2,097,964.—Rangpur, the capital, is situated on the Ghaghât river, 270 miles n.e. of Calcutta. Pop. 14,300.

RANK, a line of soldiers standing abreast or side by side; often used along with file, which is a line running from the front to the rear of a company, battalion, or regiment, the term rank and file, thus comprising the whole body of the common soldiers.

RANKE (rán'ke), Leopold von, German historian, born in 1795, died 1886. His first published work (1824) was a History of the Romance and Teutonic Nations from 1494 to 1535. This was followed by Princes and Peoples of Southern Europe in the 16th and 17th centuries (1827). The Servian Revolu-

will raise blisters. The various species found wild are known chiefly by the common names of crowfoot, buttercup, and spearwort.

RAPE, the carnal knowledge of a woman forcibly and against her will. By the English law this crime is felony, and is punishable with penal servitude for life. By 24 and 25 Vict. (1861) cap. c. unlawfully and carnally knowing any girl under the age of ten years, with or without her consent, was regarded as rape, and punishable as such; if the girl were between the ages of ten and twelve the punishment was penal servitude for five years, or imprisonment not exceeding two years with or without hard labor. But by the Criminal Law Amendment Act of 1885 the maximum penalty of penal servitude for life has been extended to the defilement of girls under thirteen; and the maximum penalty of two years' imprisonment with hard labor has been extended to the defilement of girls under sixteen years. In the case of older females consent must be withheld or there is no rape. In Scotland this crime may still be punished with death, though it never is so. In the United States the crime is treated as a felony, and the punishment is imprisonment for life or a term of years.

RAPE, a plant of the cabbage family, cultivated for its seeds, from which oil is extracted by grinding and pressure. It is also cultivated for the succulent food which its thick and fleshy stem and leaves supply to sheep when other fodder is scarce. The oil obtained from the seed, which is much the same as colza oil, is used for various economical purposes, for burning in lamps, for lubricating machinery, in medicine, etc. The oil-cake is used as food for sheep and cattle, and as a fertilizer.

RAPH'ÆL or **RAFFAELLO**, Sanzio or Santi, one of the greatest painters that ever lived, was born at Urbino 1483,

Family (Madrid); Christ Bearing the Cross (Madrid); Marriage of Joseph and the Virgin (Brera, Milan); the Ansidei Madonna (National gallery); Madonna (belonging to Lord Cowper); Tempi Madonna (Munich); and the Bridgewater Madonna (Bridgewater house). Besides these he painted as Vatican frescoes (1508-11) the allegorical figures of Theology, Philosophy, Justice, and Poetry, in the corners of the ceiling; the Fall of Adam, Astronomy, Apollo and Marsyas, and Solomon's Judgment, all having reference to the four principal figures of the apartment; and, lastly, on the fourth wall, over the windows, Prudence, Temperance, and Fortitude, besides many others. During this time Raphael prepared designs for several palaces in Rome and other cities of Italy (notable among which were the series of designs in the Villa Farnesina to illustrate the story of Cupid and Psyche). finished the Madonna for the church of St. Sixtus in Piacenza (now in Dresden), and painted the portraits of Beatrice of Ferrara, of the Fornarina of Carondelet (now in England), and of Count Castiglione. It was probably at a later period that Raphael prepared for Augustino Ghigi designs for the building and decoration of a chapel in Sta. Maria del Popolo and for Leo X. the celebrated cartoons for the tapestry of one of the chambers of the Vatican. Seven of these cartoons are now in the South Kensington museum. To this period also belong his easel-pieces of John in the Desert (of which there exist several copies); his Madonna and Child, on whom an angel is strewing flowers; a St. Margaret (Louvre); the Madonna della Seggiola (Florence), St. Cecilia (Bologna). Raphael's last and unfinished painting—the Transfiguration of Christ—is in the Vatican. Attacked by a violent fever, which was increased by improper treatment, this great artist died at the age of thirty-seven years, and was buried with great pomp in the Pantheon. His tomb is indicated by his bust, executed by Naldini, and placed there by Carlo Maratti.

RA'PHIA, a genus of palms, rather low trees with immense leaves, inhabit-



tion (1829), History of the Popes (1834-37), History of Germany in the time of the Reformation (1839-47), History of Prussia during the 17th and 18th centuries (1847-48), History of France, chiefly in the 16th and 17th centuries (1852-55), History of England in the 17th century (1859-68), besides a number of smaller works supplementary of his History of Germany.

RANSOM, the money or price paid for the redemption of a prisoner, captive, or slave, or for goods captured by an enemy, and formerly a sum paid for prisoners of war.

RANUNCULA'CEÆ, a natural order of exogenous polypetalous plants, in almost all cases herbaceous, inhabiting the colder parts of the world, and unknown in hot countries except at considerable elevations. They have radical or alternate leaves (opposite in Clematis) regular or irregular, often large and handsome flowers, and fruits consisting of one-seeded achenes or many seeded follicles. There are about 30 genera and 500 species. They have usually poisonous qualities, as evinced by aconite and hellebore in particular. Some of them are objects of beauty, as the larkspurs, ranunculus, anemone, and pæony. See next article.

RANUN'ULUS, a genus of herbaceous plants, the type of the natural order Ranunculaceæ. They have entire, lobed, or compound leaves, and usually paniced, white or yellow flowers. The species are numerous, and almost exclusively inhabit the northern hemisphere. Almost all the species are acrid and caustic, and poisonous when taken internally, and, when externally applied,



Raphael Sanzio,

died 1520. His father, Giovanni Sanzio, a painter of some merit, from whom young Raphael received his first instruction, died in 1494, and he was then intrusted to the care of an uncle. His studies, however, were not interrupted, and at the early age of twelve he was received into the studio of Perugino at Perugia as one of his pupils, and continued with that celebrated painter for six or eight years. His most important works are the Madonna del Gran Duca (Florence); Madonna del Giardino (Vienna); Holy



Raphia vinifera.

ing swampy coasts. One specie, a native of West Africa, Madagascar, Polynesia,

etc., besides yielding palm-wine, supplies materials for the roofs and other parts of houses, for baskets and other work, etc. The fibre of these palms is known as raphia or raffia, and is used for matting, for tying up plants, etc.

RAPID FIRE GUN. See Machine Gun. Quick Firing Guns.

RA'PIER, a light, highly-tempered, edgeless and finely-pointed weapon of the sword kind, used for thrusting. It is about 3 feet in length and was long a favorite weapon for duels. Its use now, however, is restricted to occasions of state ceremonial.

RAPPAHAN'NOCK, a river in Virginia, which rises in the Blue Ridge, runs e.s.e. about 130 miles, and flows into Chesapeake bay. It passes the towns of Falmouth, Fredericksburg, Port-Royal, and Leeds, and is navigable to Fredericksburg, 110 miles.

RAPTO'RES, the birds of prey, an order of birds, also called Accipitres, including those which live on other birds and animals, and are characterized by a strong, curved, sharp-edged, and sharp-pointed beak, and robust short legs, with three toes before and one behind, armed with long, strong, and crooked talons. The eagles, vultures, falcons, and owls are examples.

RAR'ITAN, a river of New Jersey, United States, formed by two branches which unitedly flow s.e., and fall into Raritan bay near Perth Amboy. It is navigable as far as New Brunswick.

RASHI, properly Rabbi Solomon-ben-Isaak, a great Jewish rabbi, born at Troyes, France, in 1040; died 1105. His most famous work is a Commentary on the Pentateuch; he also wrote commentaries on the Prophets, the Talmud, and various treatises on miscellaneous subjects.

RASO'RES, gallinaceous birds or scratchers, an order of birds comprising the sub-orders Gallinaei, or fowls, turkeys, partridges, grouse, etc., and the Columbacei, or pigeons, which are often made a distinct order. The common domestic fowl may be regarded as the type of the order. They are characterized by the toes terminating in strong claws, for scratching up seeds, etc., and by the upper mandible being vaulted, with the nostrils pierced in a membranous space at its base, and covered by a cartilaginous scale. The rosarial birds are, as a rule, polygamous in habits; the pigeons, however, present an exception to this rule, and their young are also produced featherless and helpless.

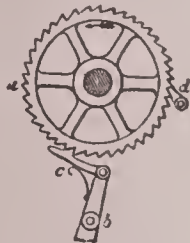
RASPBERRY, the fruit of the well-known shrubby plant and the plant itself, which is of the same genus as the bramble or blackberry, dewberry, and cloudberry. Several varieties are cultivated, either red, flesh-colored, or yellow. Raspberries are much used in cookery and confectionery, and the juice mixed with a certain portion of sugar and brandy, constitutes the liquor called raspberry brandy. Raspberry vinegar, a refreshing summer beverage and cooling drink for invalids, is composed of raspberry juice, vinegar, and sugar.

RAT, one of the rodent mammalia, forming a typical example of the family Muridæ or mice. The best known species

are the (so-called) Norway or brown rat and the true English or black rat. The brown rat grows to about 9 inches in length, has a shorter tail than the other, small ears, is of a brownish color above and white below, and is altogether a much larger and stronger animal. Supposed to have belonged originally to India and China, it only became known in Europe about the middle of the 18th century; but it is now found in almost every part of the habitable globe, and where it has found a footing the black rat has disappeared. It is a voracious omnivorous animal, swims readily in water, breeds four or five times in the year, each brood numbering about a dozen, and these again breed in about six months. The black rat is usually about 7 inches in length, has a sharper head than the other, larger ears and a much longer tail. It is much less numerous than the brown rat and more timid. To this variety belongs the white rat, which is sometimes kept as a household pet. Various other animals are called rats.

RATCHET, an arm or piece of mechanism one extremity of which abuts against the teeth of a ratchet-wheel; called also a click, pawl, or detent. If employed to move the wheel it is called a pallet. See next article.

RATCHET-WHEEL, a wheel with pointed and angular teeth, against which a ratchet abuts, used either for converting a reciprocating into a rotary motion on the shaft to which it is fixed or for admitting of circular motion in



Ratchet-wheel.

one direction only as in a winch, a capstan, etc. For both purposes an arrangement is employed similar to that shown in the figure, in which a is the ratchet-wheel, b a reciprocating lever, to the end of which is jointed the small ratchet or pallet c. This ratchet, when the lever is moved in one direction, slides over the teeth, but in returning draws the wheel with it. The other ratchet d permits of the motion of the wheel in the direction of the arrow, but opposes its movement in other the direction.

RATEL', or **HONEY-BADGER**, a carnivorous quadruped of the badger



Honey-ratel.

family, found chiefly in South and East Africa, and in India. The Cape or South

African ratel averages about 3 feet in length, including the tail, which measures 8 or 9 inches in length. The fur is thick and coarse, the color is black on the under parts, on the muzzle, and limbs, whilst the tail, upper surface, sides, and neck are of grayish hue. It is celebrated for the destruction it makes among the nests of the wild bee, to the honey of which it is very partial.

RATIO, the numerical measure which one quantity bears to another of the same kind, expressed by the number found by dividing the one by the other. The ratio of one quantity to another is by some mathematicians regarded as the quotient obtained by dividing the second quantity by the first; by others, as the quotient obtained by dividing the first by the second.

RATIONALISM, is the doctrine which affirms the prerogative and right of reason to decide on all matters of faith and morals whatever so-called "authority" may have to say on the matter. In 1835 Strauss published his Life of Jesus, a work in which, from the Hegelian stand-point, and in a destructive spirit, he discusses the origin of the New Testament. The movement which this originated is chiefly associated with scientific materialism, agnosticism, etc., and rationalism as a distinctive phase of religious controversy may be said to have then ceased.

RA'TISBON, a town of Bavaria, capital of the province of Oberpfalz or Upper Palatinate, stands on the right bank of the Danube opposite the junction of the Regen, 65 miles n.n.e. of Munich and 53 miles s.e. of Nuremberg; 1010 feet above the sea. Pop. 50,000.

RAT'LINES, small lines which traverse the shrouds of a ship horizontally, at regular distances of about 15 to 16 inches, forming a variety of ladders reaching upwards to the different masts-heads.

RATTANS', the commercial name for the long trailing stems of various species of palm forming a considerable article of export from India and the Eastern Archipelago. They have all perennial, long, round, solid, jointed, unbranching stems, extremely tough and pliable. All the species are very useful, and are employed for wicker-work, seats of chairs, walking-sticks, thongs, ropes, cables, etc.

RATTLESNAKE, a name of various venomous American snakes, distinguished from the other members of the family by the tail terminating in a series of articulated horny pieces, which the animal vibrates in such a manner as to make a rattling sound. The function of the "rattle" is dubious. The rattlesnake is one of the most deadly of poisonous serpents, but hogs and peccaries kill and eat it, finding protection in the thickness of their hides and the depth of their layers of fat. A number of species belong to the United States and Mexico. East of the Mississippi the banded rattlesnake, is the best known and most dreaded species. It is naturally a sluggish animal, ready to defend itself, but seldom commencing the attack. It feeds on rats, squirrels, small rabbits, etc., and reaches a length of 5 or 6 feet. Other species are the

striped rattlesnake, found from Mexico to Brazil; the diamond rattlesnake, the western black rattlesnake, the prairie



Rattlesnake coiled to strike.

rattlesnake, and the horned rattlesnake of the American deserts.

RAUCH (rouh), Christian, one of the most distinguished of German sculptors, born at Arolsen 1777, died 1857. He was especially great in ideal figures and in portraiture. Among his chefs d'œuvre may be mentioned the monument of King Frederick William III. and Queen Louisa in the Charlottenburg mausoleum, the colossal equestrian statue of Frederick the Great at Berlin, having the base surrounded by groups of his most distinguished contemporaries, and forming altogether one of the most notable monuments in Europe; the six colossal figures of Victory in the Walhalla, and a group representing Moses with his hands supported by Aaron and Hur.

RAVAILLAC (rà-và-yák), François, the murderer of Henry IV. of France, born 1578. His various disappointments and his religious fanaticism led him to plan the assassination of Henry IV., which he successfully accomplished 14th May, 1610. Upon this he was seized, horribly tortured, and put to death.

RAVELIN, a detached triangular work in fortification, with two embankments which form a projecting angle. In the figure b b is the ravelin with a



Ravelin.

its redout, and c c its ditch, d d being the main ditch of the fortress, and e the passage giving access from the fortress to the ravelin.

RAVEN, a large bird of the crow family. Its plumage is entirely black; it is above 2 feet in length from the tip of the bill to the extremity of the tail, and about 52 inches from tip to tip of the

extended wings. It can be taught to imitate human speech, and in a domestic state is remarkable for its destructiveness, thievishness, and love of glittering things. It flies high, and scents carrion, which is its favorite food, at the distance



Raven.

of several miles; it feeds also on fruit, small animals, etc. It is found in every part of the globe.

RAVEN'NA, a town of Italy, capital of the province of the same name, on the Montone, about 4 miles west of the Adriatic, and 43 miles east by south of Bologna. The principal edifices are the cathedral, founded in the 4th but rebuilt during the 17th century, adorned with some of Guido's finest paintings; the ancient baptistry, an octagonal structure, the church of San Vitale, one of the earliest of Christian churches, having been consecrated in 547; the Basilica of San Giovanni Evangelista, founded in 414, the church of San Apollinare Nuovo (or San Martino), the mausoleum of the empress Galla Placidia, daughter of Theodosius the Great, dating from the 5th century; the palace of Theodoric, king of the Ostro-Goths; the tomb of Dante; the town-house, library, museum, etc. Pop. 64,031. The province has an area of 820 sq. miles; pop. 235,485.

RAWAL PINDI, a town of British India, in the Punjab, situated in the district between the Indus and the Jhilam. It has an arsenal, extensive cantonments, and important military works, churches, schools, public park, etc. It is on the railway from Lahore to Peshawar, and carries on a thriving transit trade between Hindustan and Afghanistan. Pop. 87,688.

RAWLINS, John Aaron, American soldier, was born in East Galena, Ill., in 1831. On April 16, 1861, shortly after the fall of Fort Sumter, he made a powerful war speech at a meeting which was presided over by Ulysses S. Grant. Shortly afterward he became a major in an Illinois regiment, but resigned that post in order to become Grant's assistant adjutant-general, friend and adviser. He became chief of staff in November, 1862, and was honored with numerous promotions, ending with that of brevet major-general, March 13, 1865. When Grant became president he made Rawlins his secretary of war. He died in 1869.

RAWLINSON, Rev. George, born in 1815. Besides various short works on antiquity he published a translation of

Herodotus with a commentary (1858-60); The Five Great Monarchies of the Ancient Eastern World (4 vols. 1862-67), followed by the Sixth (1873), and the Seventh Oriental Monarchy (1876); History of Ancient Egypt (2 vols. 1881); Egypt and Babylon (1885); Phœnicia (1889), etc. He died in 1902.

RAWLINSON, Sir Henry Creswicke, G.C.B., brother of the above, born in 1810. He has published A Commentary on the Cuneiform Inscriptions of Babylon and Assyria (1850); Outline of the History of Assyria (1852); Notes on the Early History of Babylon (1854); and the Cuneiform Inscriptions of Western Asia, edited along with E. Norris and G. Smith (5 vols. 1861-70). He was D.C.L. of Oxford, LL.D. of Cambridge F.R.S., and a corresponding member of the French Institute. He died in 1895.

RAY, a family of fishes, including the skate and allied forms, recognized by the flattened body and by the extremely broad and fleshy pectoral fins, which seem to be mere continuations of the body. These fishes produce large eggs which are inclosed in cartilaginous capsules quadrilateral in form, with pro-



Ray.

cesses at the corners, and known familiarly as "mermaids' purses," etc. The most common members of this group are the thornback ray or skate, so named from the curved spines which arm the back and tail; and the common gray or blue skate, which possesses an acutely-pointed muzzle, the body being somewhat lozenge-shaped, and the color ashy-gray above. The starry ray is so called from having a number of spines on its upper surface rising from rayed or starlike bases; it reaches a length of 30 inches. The sting ray occurs in the Mediterranean sea, but is also found on the British coasts, having the tail armed with a long spine, serving as a means of defense. The horned ray, common in the Mediterranean sea, attains occasionally a large size.

RAYNOUARD (rà-nô-är), François Juste Marie, French poet and philologist, born at Brignoles, Provence, 1761; died 1836. We wrote several tragedies, such as Scipion, Don Carlos, Charles I., Les Templiers, but he is chiefly remembered as a philologist who revived the study of Provençal by his Choix des Poesies originales des Troubadours (1816-21), six vols. 8vo; Lexique Roman, ou Dictionnaire de la Langue des Troubadours (1836-44, six vols. 8vo); Grammaire Comparée des Langues de l'Europe Latine dans leurs Rapports avec la Langue des Troubadours (1821, 8vo).

RAZORBILL (rā'zor-bil), the razor-billed auk, or tinker, so called from the deep, compressed, and trenchant bill. The bill is feathered for about one-half its length, in the rest of its extent being vertically furrowed, and hooked at the tip; one of the furrows is white, the bill being otherwise black, like the feet; the mouth is yellow. The plumage is black on the upper parts, the lower parts from the neck in summer, and from the bill in winter, being white; there is a narrow white line from the bill to the eye, and the tips of the secondaries are white. The bird is about 18 inches long, and 27



Razorbill, in winter plumage.

in extent of wings. It inhabits arctic and northerly regions of both hemispheres, subsists chiefly on fish, and nests on rocky sea-coasts, laying a single egg about 3 by 2 inches, white or whitish, spotted and blotched with different shades of brown. The flesh is eatable.

REACTION, in physics, counteraction, the resistance made by a body to the action or impulse of another body, which endeavors to change its state, either of motion or rest. It is an axiom in mechanics that "action and reaction are always equal and contrary," or that the mutual actions of two bodies are always equal and exerted in opposite directions. In chemistry, the term is applied to the mutual or reciprocal action of chemical agents upon each other. In pathology, reaction is the action of an organ which reflects upon another the irritation previously transmitted to itself.

READE (rēd), Charles, novelist, son of Mr. John Reade of Ipsden house in Oxfordshire, born in 1814, died 1884. The most scholarly and artistic of his writings, *The Cloister and the Hearth*, dealing with the lives of the parents of Erasmus, appeared in 1861, and among the more important of his other works are: *The Course of True Love Never Did Run Smooth*, *Love Me Little Love Me Long*, *White Lies*, *Hard Cash*, *Griffith Gaunt*, *Put Yourself in His Place*, *A Terrible Temptation*, *Singleheart and Double-face*, *A Perilous Secret*, etc.

READ, Nathan, American inventor, was born in Warren, Mass., in 1759. In 1788 he conceived the idea of utilizing the steam engine for propelling boats and carriages, and, with that end in view, began a series of experiments which resulted in the invention (1789) of the vertical multitubular fire-box boiler now in general use. In 1798 he patented a machine for cutting and heading nails at one operation. He was a member of congress from 1800 to 1803. Among his inventions

were: a pumping engine, a threshing machine, a method for equalizing the action of windmills, and a plan for utilizing the force of the tide, by means of reservoirs. He died in 1849.

READ, Opie Percival, an American author, was born in Nashville, Tenn., in 1852. He edited the *Kansas Gazette* from 1878 until 1881. In 1883 he established the *Arkansaw Traveler*, of which he was the editor until 1893. His works include: *A Kentucky Colonel*, *Emmet Bonlore*, *A Tennessee Judge*, *My Young Master*, *Bolanyo*, *In the Alamo*, *The Jucklins*, *An American in New York*, and several plays.

READ, Thomas Buchanan, American poet and artist, born in Chester co., Pa., in 1822. He is best known as a poet, especially for his stirring *Sheridan's Ride*, and his charming stanzas entitled *Drifting*. His first volume, *Poems*, appeared in 1847. *Lays and Ballads* followed the next year; *The New Pastoral*, an elaborate description of Pennsylvania life; *The House by the Sea*. In 1848 he compiled a volume entitled *Female Poets of America*, which was illustrated by engravings of portraits painted by himself. He died in New York City in 1872.

READING (red'ing), a parl. county, and municipal borough of England, capital of the county of Berks, on the Kennet, near its confluence with the Thames, 36 miles west of London. There are interesting remains of a magnificent abbey founded by Henry I., who was buried within its precincts in 1135. Reading sends one member to parliament. Pop. 72,214.

READING, a city in Pennsylvania, on the left bank of the Schuylkill, 52 miles northwest of Philadelphia. The chief industries are muslin and woolen goods, felt hats, iron-founding, tanning, etc. Pop. 92,300.

READJUSTERS, the name applied to a political party in Virginia which favored the readjustment or scaling down of the state debt which at the close of the civil war amounted to about \$41,000,000, and which was increased by the extravagance and corruption of the reconstruction governments.

REAGAN (rē'gan), John H., senator, was born in Sevier co., Tenn., October 8, 1818. In 1839 he went to Texas, where he served against the Indians. He was elected to congress in 1856, serving till the war broke out, when he became a member of the state secession convention; voted for secession, and was sent to the provisional congress. He was made postmaster-general of the confederacy, and was for a short time acting secretary of the treasury. After the fall of the confederacy he was captured with Jefferson Davis, and confined for many months in Fort Warren. He was elected to congress in 1874, and successively till 1887, in which year he was elected senator for Texas. He resigned from the senate to become chairman of the Texas State Railroad Commission. He was one of the authors of the interstate commerce law, passed in 1887. He died in 1905.

REA'GENT, in chemical analysis, a substance employed as a test to determine the presence of some other sub-

stance. Thus, the infusion of galls is a reagent which detects iron by a dark purple precipitate; the prussiate of potash is a reagent which exhibits a blue with the same metal, etc.

REAL, in law, pertaining to things fixed, permanent, or immovable. Thus real estate is landed property, including all estates and interest in lands which are held for life or for some greater estate, and whether such lands be of freehold or copyhold tenure. So a real action is an action brought for the specific recovery of lands, tenements, and hereditaments.

REALISM, in metaphysics, as opposed to idealism, the doctrine that there is an immediate or intuitive cognition of external objects, while according to idealism all we are conscious of is our ideas. According to realism external objects exist independently of our sensations or conceptions; according to idealism they have no such independent existence. As opposed to nominalism, it is the doctrine that asserts that general terms like man, tree, etc. are not mere abstractions, but have real existences corresponding to them. In the middle ages there was a great controversy between the realists and the nominalists, the chief controversy which divided the schoolmen into rival parties. The realists maintained that things and not words are the objects of dialectics. Under the denomination of realists were comprehended the Scotists and Thomists, and all other sects of schoolmen, except the followers of Occan and Abelard, who were nominalists.

REAM, a quantity of paper, consisting of 20 quires of 24 sheets each. The printer's ream consists of 21½ quires, or 516 sheets.

REAPING-MACHINE, or **REAPER**, a machine for cutting down standing wheat, etc., usually worked by a pair of horses, the cutting machinery being driven by being connected with the wheels on which the machine is drawn over the field. The cutting is effected rather in the manner of a pair of scissors than in that of a scythe, and a series of small toothed wheels have to be connected with the main wheel or wheels so as to produce the fast motion necessary for driving the cutting knives. These knives generally consist of triangular pieces of steel riveted to an iron bar, and are sometimes smooth-edged and sometimes tooth-edged. The knife-bar projects horizontally from the side of the machine at a short distance above the ground, and moves backward and forward on guides fixed at the back of a number of pointed fingers, which enter the standing grain and guide the straw to the edges of the knives. The motion of the bar being very rapid, the grain is cut down with corresponding speed, and as it is cut it is received on a platform fixed behind the knife-bar. In most cases a revolving rake with four inclined arms is attached to such machines, and set in motion by the driving-wheel. Two of the arms bring the wheat well on to the knife-bar, and the others deliver the wheat cut at the back of the machine. Many of the recent machines are also fitted with a binding apparatus. An endless apron receives the grain as it is cut, and



THE RED CROSS SOCIETY IN THE ARMY.

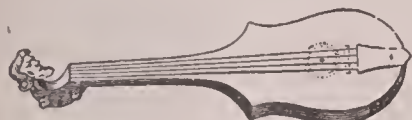
The horrors of war are alleviated by the work of this society, whose mission of humanity is exerted in every part of the world where nations settle their disputes by battle. Here is shown one of the practical features of the work of these ministering angels.

deposits it in a trough on the outer side of the machine. By an ingenious mechanical arrangement the loose straw is caught and compressed by two iron arms; wire from a reel is passed round the sheaf, fastened by twisting, cut away, and the bound sheaf is tossed out of the trough by one of the arms by which it was compressed. Other apparatus are constructed so as to bind with cord, straw rope, etc. See Agriculture.

REASON, a faculty of the mind by which it distinguishes truth from falsehood, and which enables the possessor to deduce inferences from facts or from propositions, and to combine means for the attainment of particular ends. Reason is the highest faculty of the human mind, by which man is distinguished from brutes, and which enables him to contemplate things spiritual as well as material, to weigh all that can be said or thought for and against them, and hence to draw conclusions and to act accordingly. In the language of English philosophy the terms reason and understanding are sometimes nearly identical, and are so used by Sewart; but in the critical philosophy of Kant a broad distinction is drawn between them.

REAUMUR (rā-ō-mūr), René Antoine Ferchault de, French physicist and naturalist, born in 1683 at La Rochelle, died 1757. As a natural philosopher he is celebrated for the invention of an improved thermometer, which he made known in 1731 (see Thermometer); but his greatest work is the *Mémoires pour servir à l'Histoire Naturelle des Insectes*, 6 vols.

REBEC, an old stringed instrument somewhat similar to the violin, having properly three strings tuned in fifths,



Rebec of the sixteenth century.

and played with a bow. It was of Arabian or Turkish origin and was introduced by the Moors into Spain.

REBUS, a group of words or a phrase written by figures or pictures of objects whose names resemble in sound the



Rebus of Abbot Islip, Westminster abbey. Rebus of Bishop Oldham, Exeter cathedral.

words or the syllables of which they are composed; thus, "I can see you" might be expressed by figures or pictures of an eye, a can, the sea, and a ewe. In heraldry a rebus is a device on a coat of arms conveying an illusion to the name of the person, as castles for Castleton, three cups for Butler. The accompanying cuts show rebuses on personal names (not very happy attempts, however), the one standing for the name Oldham (Owledom), the other for Islip. I slip

may be obtained several ways, as from the eye and the slips on the tree; or the figure may be supposed to say "I slip," or the hand to belong to a person slipping.

RECAMIÉ (rā-kā-mi-ā), Jeanne Françoise Julie Adélaïde, whose maiden name was Bernard, born at Lyons 1777, died 1849. At the age of sixteen she went to Paris, and was there married to Jacques Récamier, a rich banker, more than double her own age. From this time her aim was to surround herself with personal admirers, and to attract to her salon the chief personages in French literature and politics.

RECIPROCITY, a term in economics commonly applied in international relationships to the arrangement whereby two nations mutually agree to import to each other certain goods, either duty free or with duties which are equivalent. See Free-trade.

RECONNAISSANCE, in military affairs, an examination of a territory or of an enemy's position, for the purpose of directing military operations. The term is also used in geodetics, etc., a reconnaissance being an examination of a region as to its general natural features, preparatory to a more particular survey, as for determining the location of a road, a railway, a canal, or the like.

RECONSTRUCTION, in American history, the method by which the seceded states, after the war, were restored to their former relations with the union.

RECTANGLE, a right-angled parallelogram, or a quadrilateral figure having all its angles right angles and its opposite sides equal. Every rectangle is said to be contained by any two of the sides about one of its right angles.

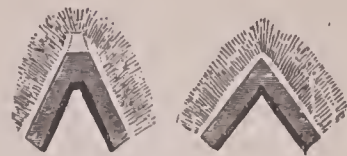
RECTIFY, in chemistry, to refine by repeated distillation or sublimation, by which the fine parts of a substance (as some kind of spirits) are separated from the grosser. To rectify liquors, in the spirit trade, is to convert the alcohol produced by the distiller into gin, brandy, etc., by adding flavoring materials to it. Thus in order to convert the spirit into London gin, juniper berries and coriander seeds are added previous to the last rectification. Ceanothic ether and other things give the flavor of brandy.

RECTUM, in anatomy, the third and last part of the large intestine opening at the anus; so named from an erroneous notion of the old anatomists that it was straight.

RED, one of the primary colors, the color of that part of the spectrum which is farthest from the violet. The red rays are the least refrangible of all the rays of light. (See Color.) Red pigments or coloring matters include vermilion, realgar, cochineal, lakes and madders, coal-tar colors, etc. The different forms of oxide of iron are Indian red, which is pure, finely ground hæmatite; Venetian red and colcothar, which are coarser forms of the same substance. Minium or lead oxide, and another form of the same substance containing a little carbonate, are known as Paris red.

REDAN, in field fortification, the simplest kind of work employed, consisting of two parapets of earth raised so as to form a salient angle, with the

apex toward the enemy and unprotected on the rear. Several redans connected



Redans.

by curtains form lines of intrenchment.

RED-BIRD, the popular name of several birds in the United States, as the summer red-bird, the Baltimore oriole or hang-nest.

REDBREAST, or **ROBIN RED-BREAST**, a species of bird belonging to the family of warblers. The red breast of the male is the distinguishing feature of these well-known birds, the female possessing the breast of a duller yellowish-brown color. The young are of a dull yellowish-green color, and want the characteristic breast-coloring of the



American robin.

adult. The nest is made of moss and leaves, and is lined internally with feathers. The eggs number five or six, and are white, spotted with pale brown. The robin redbreast of America is a thrush, congeneric with the British blackbird; and one of the bluebirds, is usually called the blue robin.

RED CEDAR, a species of juniper found in North America and the West Indies; the heartwood is of a bright red, smooth, and moderately soft, and is in much request for the outsides of black-lead pencils.

RED CORAL, an important genus of sclerobasic corals belonging to the order of Alcyonaria. Red coral is highly valued for the manufacture of jewelry, and is obtained from the coasts of Sicily, Italy, and other parts of the Mediterranean.

RED CROSS SOCIETIES, international associations formed to mitigate the horrors of war by alleviating the sufferings of the sick and wounded. M. Jean Henri Dunant, a citizen of Geneva, Switzerland, was an eye witness at the Battle of Solferino to the unnecessary suffering that resulted from inability of the regular surgical corps to take care of the thousands of wounded who lay upon the field. In his book *Un Souvenir de Solferino*, published three years afterward, he described the horrors witnessed and proposed that societies be formed in every country for the purpose of training nurses to supplement the regular military surgical

corps in time of war. An international conference was held in Geneva in 1863, sixteen nations being present, and a provisional program agreed upon. The Geneva convention was signed in 1864 by fourteen nations, a number that has now been increased to forty three. In 1884 the American National Red Cross society was formed, and its usefulness widened by including not only relief during war, but also during great calamities, such as famine, pestilence, flood, or fire. The American association has expended over \$2,000,000, and has afforded relief to the sufferers from the Michigan fires of 1881, the Florida yellow fever of 1888, the Johnstown flood of 1889, the Russian famine of 1891-92, the South Carolina tidal wave of 1893, the Armenian massacres of 1896, the Spanish reconcentrado system in Cuba in 1897-98, the Galveston tidal wave of 1900, the Mont Pelée eruption of 1902, and the San Francisco earthquake and fire in 1906. The association rendered valuable assistance during the Spanish-American war.

RED CURRANT, a deciduous shrub much cultivated for its fruit, indigenous in the northern portions of Europe and America. The juice of the fruit is used for making jelly, and a well-known fermented liquor called current wine.

RED-FISH, a species of fish found on the Atlantic coast of North America, a large red fish caught in considerable



Redfish.

numbers for food. A smaller species receives the same name, and is called also red-perch, rose-fish, etc.

RED GUM, the popular name of a florid eruption usually occurring in infants before and during first dentition, and appearing on the most exposed parts, as the face, neck, arms, and hands. It is almost always an innocent disease, and seldom lasts over a month.

RED HAND, in heraldry, originally the arms of the province of Ulster, but granted to baronets as their distinguishing badge on the institution of the order in 1611. It consists of a sinister (or left) hand, open, erect, showing the palm.

RED-LEAD, an oxide of lead produced by heating the protoxide in contact with air. It is much used as a pigment, and is commonly known as Minium.

RED OCHRE, a name common to a variety of pigments, rather than designating an individual color, and comprehending Indian red, light red, Venetian red, scarlet ochre, Indian ochre, reddle, bole, and other oxides of iron. As a mineral it designates a soft earthy variety of hematite.

REDOUT', in fortification, a general name for nearly every class of works wholly inclosed and undefended by re-

entering or flanking angles. The word is, however, most generally used for a small inclosed work of various form—polygonal, square, triangular, or even circular, and used mainly as a temporary field work.

RED PINE, a species of pine also called Norway Pine. Its wood is very resinous and durable, and is much used in house and ship-building. It produces turpentine, tar, pitch, resin, and lamp-black.

RED-POLE (red-poll), a name given to several species of linnets. The same name is given to the American red-headed warbler and yellow red-pole.

RED RIVER, a large river of the United States, the southernmost of the great tributaries of the Mississippi. It rises in Northern Texas, and has several sources, the chief, besides the main stream, being called the North and South Forks, which unite with it on the boundary of Texas and Oklahoma territory. The stream then flows e.s.c., forming the boundary between Texas and the Indian territory, and between Texas and Arkansas; cuts off a corner of the latter state, and then flowing through Louisiana falls into the Mississippi, 125 miles northwest of New Orleans; total course estimated at 1550 miles; chief affluents—the Washita, which joins it in Louisiana; and the False Washit which it receives in the Indian territory. Much of its course is through rich prairies. About 1200 miles of the river are useful for navigation, but its mouth at low water can be entered only by boats drawing 2 feet.

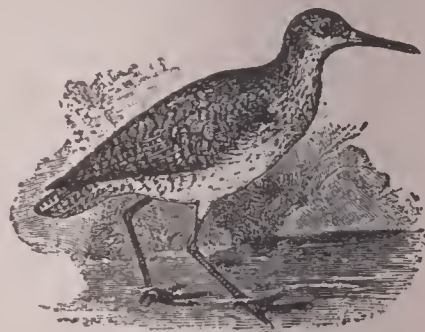
RED RIVER OF THE NORTH, a river of North America, which rises in Elbow lake, in Minnesota, flows south and southwest, and then nearly north, crossing from the United States into Manitoba, where it falls into Lake Winnipeg. Its entire length is 665 miles, 525 of which are in the United States. In Manitoba it receives the Assiniboine, another large stream, at its junction with which stands the town of Winnipeg.

RED RIVER SETTLEMENT, a settlement formed in 1812 by the Earl of Selkirk on the banks of the above river; repurchased by the Hudson's Bay company in 1836; finally transferred to the Canadian government in 1870 and now made part of the province of Manitoba.

RED SEA, or **ARABIAN GULF**, a branch of the Indian ocean, communicating with it by the Strait of Bab-el-Mandeb, stretching in a n.n.w. direction between Arabia on the east, Abyssinia, Nubia, and Egypt on the west, and connected with the Mediterranean on the north by the Suez canal. It forms a long and narrow expanse, stretching for 1450 miles, with a breadth which averages about 180 miles, but diminishes gradually at its extremities. At the northern end it divides into two branches, one of which, forming the Gulf of Akaba, penetrates into Arabia for about 100 miles, with an average breadth of about 15 miles; while the other, forming the Gulf of Suez, penetrates between Arabia and Egypt for about 200 miles, with an average breadth of about 20 miles. The shores consist generally of a low, sandy tract, varying in width from 10 to 30 miles, and suddenly terminated

by the abutments of a lofty table-land of 3000 feet to 6000 feet high. Occupying a long deep valley this water expanse has gradually been divided into three channels formed by coral reefs and islands. In the main channel the depth reaches in one place 1054 fathoms, but diminishes toward the extremities to 40 fathoms, while in the harbor of Suez it amounts to only 3 fathoms. The cross trade consists largely of pilgrims to and from Mecca; the traffic up and down has been immensely increased by the Suez canal. The Isrealites are supposed to have crossed the Red sea at its northern extremity in the Gulf of Suez, and near the town of that name, but opinions vary as to the precise spot.

REDSHANK, a bird, so called from its red legs. It is about 11 inches long, resides in Britain all the year, but is known also as a summer bird of passage in the



Redshank.

most northern parts of Europe and Asia, occurring in winter as far south as India. The spotted redshank visits Britain in spring and autumn on its migrations north and south.

REDSTART, a bird belonging to the family Sylviadæ, nearly allied to the redbreast, but having a more slender form and a more slender bill. It is found in almost all parts of Britain as a summer bird of passage, and has a soft, sweet song. The tail is red, whence the name, start being A.-Saxon steort, a tail. The forehead is white, the throat black, the upper parts lead-gray or brown. The



American redstart.

black redstart is distinguished from the common redstart by being sooty black on the breast and belly where the other is reddish brown, and is only an occasional visitor to Great Britain. The American redstart is a small bird of the family Muscipidæ or fly-catchers, common in most parts of North America.

RED-TOP, a well-known species of bent-grass, highly valued in United States for pasturage and hay for cattle.

RED-WOOD, the name of various sorts of wood of a red color, as an Indian dyewood; a coniferous tree of California, the red-wood of the timber trade. The tree reaches a very great size, and forms forests in the coast mountains of California.

REEBOK (rā'bok; that is roebuck), a species of South African antelope. The horns are smooth, long, straight, and slender. The reebok is 2½ feet high at the



Roebuck.

shoulder, of a slighter and more graceful form than the generality of other antelopes and extremely swift.

REED, Thomas Brackett, an American political leader, was born at Portland, Maine, in 1839. In 1868-69 he was a member of the lower house of the Maine legislature, and in 1870 sat in the state senate. From 1870 to 1872 he was attorney-general of Maine; from 1874 to 1877 solicitor of the City of Portland. In 1876 he was elected to congress and was continuously reelected until 1898. In 1889, 1895, 1897 he was chosen speaker of the house. Before the expiration of his last term he resigned his seat in congress and entered upon the practice of law in New York City. In 1896 Reed was a candidate for the republican nomination for the presidency. He died in 1902.

REED, Walter, American army surgeon, sanitarian, and bacteriologist, was born in Virginia in 1851. He was appointed assistant surgeon in the army in 1875. In 1893 he was appointed curator of the Army Medical museum in Washington. In 1898 he was placed at the head of a board to investigate the epidemic occurrence of typhoid fever among the troops assembled for the Spanish-American war. It developed that infected water was not an important factor but that the infection was distributed by the agency of flies and on the hands, feet and clothing of the men. In 1899 Reed, with his assistant, Carroll, demonstrated the fallacy of the claim of Sanarelli that the bacillus icteroides was the causative agent of yellow fever. In 1900 Reed went to Havana and demonstrated that yellow fever is transmitted by the bite of mosquitoes of a certain variety, which have become infected by previously biting persons sick

of yellow fever, with the result that yellow fever was exterminated in Cuba. He died in 1902.

REED, a name usually applied indiscriminately to all tall, broad-leaved grasses which grow along the banks of streams, pools, and lakes, and even to other plants with similar leaves, growing in such situations, as the bamboo. The largest of all the grasses of northern climates, is used for roofing cottages, etc. The sea-reed or mat-grass is often an important agent in binding together the masses of loose sand on sea-shores. The bur-reed of Britain is of the reed-mace order.

REED, in music, a vibrating slip or tongue in the mouth-piece through which a hautboy, bassoon, or clarinet is blown, originally made of reed; or one of the thin plates of metal whose vibrations produce the notes of an accordion, concertina, or harmonium, or a similar contrivance in an organ-pipe.

REED-BIRD. See Rice-bunting.

REED-MACE, a plant known by the name of cat-tail, and grows in ditches and marshy places, and in the borders of ponds, lakes, and rivers. They are tall, stout, erect plants, sometimes 6 or 8 feet high, with creeping root-stocks, long flag-like leaves, and long, dense, cylindrical brown spikes of minute flowers. They are sometimes erroneously called bulrush.

REEF, a certain portion of a sail between the top or bottom and a row of eyelet-holes running across the sail, one or more reefs being folded or rolled up to contract the sail in proportion to the increase of the wind. There are sets of cords called reef-points attached to the sail for tying up the reefs, and the sail is also strengthened by reef-bands across it. There are several reefs parallel to each other in the superior sails, and



Wherry with fore-sail reefed, the main-sail showing reef-bands and reef-points.

there are always three or four reefs parallel to the foot or bottom of the chief sails which are extended upon booms. Many ships are now fitted with sails which can, by a mechanical appliance, be reefed from the deck.

REEF, a chain, mass, or range of rocks in various parts of the ocean, lying at or near the surface of the water.

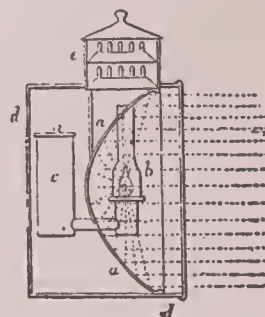
REEL, a machine on which yarn is wound to form it into hanks, skeins, etc. Also a skeleton barrel attached to the butt of a fishing-rod, around which the inner end of the line is wound, and from which it is paid out as the fish runs away when first hooked.

REEL, a lively dance peculiar to Scotland, in one part of which the couples usually swing or whirl round, and in the other pass and repass each other, forming the figure 8. The music for this dance, called by the same name is generally written in common time of four crotchets in a bar, but sometimes in jig time of six quavers.

REEVES, John Sims, tenor singer, born at Shooters' Hill, Kent, in 1822, appeared as a baritone on the stage at Newcastle in 1839; joined a company at Drury Lane under Macready as second tenor in 1841; visited the continent and studied under Bordogni at Paris, and Mazzucato at Milan; and in 1847 returned to England, where he met with great success. He devoted himself more especially to oratorio and ballad singing and long held the reputation of being the first of modern tenors. He published an autobiography in 1889. Died in 1900.

REFERENDUM is a term used in the United States to denote the reference to the citizen voters of resolutions or laws passed by their representatives. If these, when so referred, are accepted by the majority of the voters of the canton, then they become part of the law of the land; but if they are rejected, then the rejection is final. The referendum is obligatory when the law or resolution affects the constitution; in other cases it is optional, and may be demanded on the requisition of a certain number of voters.

REFLECTOR, a polished surface of metal, or any other suitable material, applied for the purpose of reflecting



Parabolic reflector.

rays of light, heat, or sound in any required direction. Reflectors may be either plane or curvilinear; of the former the common mirror is a familiar example. Curvilinear reflectors admit of a great variety of forms, according to the purposes for which they are employed; they may be either convex or concave, spherical, elliptical, parabolic, or hyperbolic, etc. The parabolic form is perhaps the most generally serviceable, being used for many purposes of illumination, as well as for various highly important philosophical instruments. The annexed cut is a section of a ship lantern fitted with an argand lamp and parabolic reflector. a a is the reflector, b the lamp, situated in the focus of the polished concave paraboloid, c the oil cistern, d the outer frame of the lantern, and e the chimney for the escape of the products of combustion.

REFLEX NERVOUS ACTION, in physiology, those actions of the nervous system whereby an impression is transmitted along sensory nerves to a nerve

center, from which again it is reflected to a motor nerve, and so calls into play some muscle whereby movements are produced. These actions are performed involuntarily, and often unconsciously, as the contraction of the pupil of the eye when exposed to strong light.

REFORMATION, the term generally applied to the religious revolution in the 16th century which divided the Western church into the two sections known as the Roman Catholic and the Protestant. Before this era the pope exercised absolute authority over the whole Christian church with the exception of those countries in which the Greek or Eastern church had been established. He also claimed supremacy in temporal affairs wherever his spiritual authority was recognized. The great movement known as the Reformation was started by Martin Luther, an Augustine monk of Erfurt, professor of theology in the University of Wittenberg; and what immediately occasioned it was the sale of indulgences in Germany by a duly accredited agent, Johann Tetzel, a Dominican monk of Leipzig. Luther condemned this abuse, first in a sermon and afterward in ninety-five theses or questions which he affixed to the door of the great church, October 31st, 1517. This at once roused public interest and gained him a number of adherents, among them men of influence in church and state. Luther urged his spiritual superiors and the pope to put a stop to the traffic of Tetzel and to reform the corruptions of the church in general. A heated controversy now arose, Luther was fiercely assailed, and in 1520 excommunication was pronounced against him by Pope Leo X. Upon this the reformer appealed to a general council; and when his works were burned at Mainz, Cologne, and Louvain, he publicly committed the bull of excommunication with the papal canons and decrees to the flames (December, 1520). From this time Luther formally separated from the Roman church, and many of the principal German nobles—Hutten, Sickingen, Schaumburg, etc., the most eminent scholars, and the University of Wittenberg, publicly declared in favor of the reformed doctrines and discipline. Luther's bold refusal to recant at the Diet of Worms (April 17, 1521), gave him increased power, while the edict of Worms and the ban of the emperor made his cause a political matter.

The Reformation in England was only indirectly connected with the reform movement in Germany. Wickliffe, and the Lollards, the revival of learning, the writings of More, Colet, and Erasmus, the martyrdom of Thomas Bilney, had all combined to render the doctrine and discipline of the church unpopular. This feeling was greatly increased when the writings of Luther and Tyndale's translation of the Bible found eager readers. Then the political element came in to favor the popular reform movement. Henry VIII., in his efforts to obtain a divorce from Catherine, found it necessary to repudiate the papal supremacy and declare himself by act of parliament (1534) the supreme head of the Church of England. To this the pope replied by threats of excommunication, which

were not, however, immediately executed. Yet the breach with Rome was complete, so far, at least, as the king was concerned. Under the new laws of supremacy and treason several of the clergy suffered at Tyburn; Sir Thomas More and Fisher, bishop of Rochester, were beheaded at Tower Hill; and the lesser and greater monasteries were suppressed.

In Scotland the movement was more directly connected with the continent, and in particular with Geneva. The first indication of the struggle against the Roman doctrine is found in the martyrdom (1528) of Patrick Hamilton; and this policy of suppression was continued (1539-46) with great severity by Cardinal Beaton, until he himself became the victim of popular vengeance. Perhaps the most important result of this persecution, and the martyrdom of George Wishart, which Beaton had brought about, was that it determined John Knox to embrace the new reformed faith. In 1546-47 the Scottish reformer established himself as preacher to the Protestant congregation which held the castle of St. Andrews. When the castle was captured by the French fleet Knox was made prisoner and treated as a galley-slave, but regained his liberty after about eighteen months' hardship, and settled in England. During the Marian persecutions he withdrew to the continent and visited the churches of France and Switzerland, but returned to Scotland in 1559. Here he at once joined the Protestant party; preached in Dundee, Perth, and St. Andrews, amid public tumult and the destruction of images, altars, and churches; and finally, under the protection of the lords of the congregation, he established himself as a preacher of Protestantism in St. Giles, Edinburgh. From this center Knox traveled all over Scotland teaching the reformed faith; and such was the roused spirit of the people that when the Scottish parliament assembled (1560) a popular petition was presented demanding the abolition of popery. This was promptly accomplished, and at the assembling of the new Church of Scotland shortly afterward Knox presented his reformed system of government under the name of the First Book of Discipline which was adopted by the assembly. (See Knox.) The position thus secured by the reformer was maintained and the Reformation successfully established in Scotland. In Ireland for various causes the Reformation never made much progress.

REFORMATORY SCHOOLS, schools instituted for the training of juvenile offenders (under sixteen) who have been convicted of an offense punishable by penal servitude or imprisonment. The offender, after undergoing a short imprisonment, is committed to a certified reformatory under an order from the court, and there detained for a period not less than two and not more than five years.

REFRACTION, the deflection or change of direction impressed upon rays of light obliquely incident upon and passing through a smooth surface bounding two media not homogeneous, as air and water—or upon rays traversing a

medium, the density of which is not uniform, as the atmosphere. A familiar instance of refraction is the broken appearance which a stick presents when thrust partly into clear water, the portion in the water apparently taking a different direction from the other portion. Glass, water, and other solids and fluids each have a different power of refraction, and this power in each case may be expressed numerically by a number known as the index of refraction. Atmospheric refraction is the apparent angular elevation of the heavenly bodies above their true places, caused by the refraction of the rays of light in their passage through the earth's atmosphere, so that in consequence of this refraction the heavenly bodies appear higher than they really are. It is greatest when the body is on the horizon, and diminishes all the way to the zenith, where it is nothing. Double refraction is the separation of a ray of light into two separate parts, by passing through certain transparent mediums, as Iceland spar, one part being called the ordinary ray, the other the extraordinary ray. All crystals except those whose three axes are equal exhibit double refraction.

REFRACTOR, or REFRACTING TELESCOPE. See Telescope.

REFRIGERANT (rē-frij'-), a cooling medicine, which directly diminishes the force of the circulation, and reduces bodily heat without any diminution of nervous energy. The agents usually regarded as refrigerants are weak vegetable-acids, or very greatly diluted mineral acids; effervescing drinks, saline purgatives, etc. Refrigerants in medicine and surgery are also applied externally in the form of freezing-mixtures prepared with salt and pounded ice for the purpose of lowering the temperature of any particular part of the body.

REFRIGERATION, the art of producing cold by artificial means. Mechanical refrigeration is employed in the manufacture of artificial ice, for the freezing and chilling of freshly killed meat in slaughter houses, the cooling of meat, fish, fowl, fruits, vegetables, and other perishable provisions, the cooling of the atmosphere of dwellings and hospitals, and for a variety of manufacturing processes. The refrigerating devices all belong to one or the other of the following five classes: (1) the liquefaction process by which the more or less rapid liquefaction of a solid is utilized to abstract heat; (2) the vacuum process, by which the abstraction of heat is effected by the evaporation of a portion of the liquid to be cooled; (3) the compression process, in which the abstraction of heat is effected by the evaporation of a separate refrigerating agent of a more or less volatile nature, which agent is subsequently returned to its original condition by mechanical compression and cooling; (4) the absorption process, by which the abstraction of heat is effected by the evaporation of a separate refrigerating agent of more or less volatile nature under the direct action of heat, which agent again enters into solution with a liquid; (5) the cold air process in which air or other gas is first compressed, then cooled, and after-

REFRIGERATOR

ward permitted to expand while doing work.

REFRIGERATOR, a name applied to cooling apparatus of various kinds. One kind is an apparatus for cooling wort, beer, etc., consisting of a large shallow vat traversed by a continuous pipe through which a stream of cold water is passed. The wort, etc., runs in one direction and the water in another, so that the delivery end of the wort is exposed to the coolest part of the stream of water. Another kind of refrigerator is a chest or chamber holding a supply of ice to cool provisions and prevent them spoiling in warm weather; or a vessel surrounded by a freezing-mixture used in the manufacture of ice-cream, ices, etc.

REFUGEE', a person who seeks safety in a foreign country to escape persecution for religious or political opinions. A large historical movement of this kind occurred when the Edict of Nantes was repealed in France (1685). Such were the oppressions then put upon the Protestants by the dominant Roman Catholic party that 800,000 of the former, it is estimated, sought refuge in England, Denmark, Holland, Switzerland, and Germany.

REGAL, a small portable organ played with the fingers of the right hand, the



Regal, from an old painting.

left being used in working the bellows. It was much used during the 16th and 17th centuries.

REGA'LIA, the emblems or insignia of royalty. The regalia of England consist of the crown, scepter with the cross, the verge or rod with the dove, the so-called staff of Edward the Confessor, several swords, the ampulla for the scared oil, the spurs of chivalry, and several other articles. These are preserved in the jewel-room in the Tower of London.

REGENERATION, in theology, is the equivalent used by the English translators of the Bible for the Greek word *palingenesia*, which occurs only twice in the New Testament, in Matt. xix. 28 and in Titus iii. 5. In the former passage the term is applied generally to the gospel dispensation as a process of renovation, in the latter it is used as descriptive of the process of individual salvation. An equivalent term is used in 1 Peter i. 3, where it is translated "begotten us again," and in one or two other passages regeneration, as a theological term, refers to the doctrine of a change effected upon men by divine grace, in order to fit them for being par-

takers of the divine favor, and for being admitted into the kingdom of heaven.

REGENT-BIRD, or **KING HONEY-EATER**, a very beautiful bird of Australia, belonging to the family *Meliphagidæ* or honey-eaters. The color of the plumage is golden yellow and deep velvety black. It was discovered during



Regent-bird.

the regency of George IV., and was named in compliment to him.

REGGIO (red'jō) **DI CALABRIA**, a seaport of South Italy, capital of a province of the same name, on the east coast of the Strait of Messina, a handsome and beautifully-situated town. Pop. 23,853.—The province occupies the southwestern extremity or toe of Italy, and is a rugged and mountainous region. The area is 1515 sq. miles; the pop. 398,086.

REGGIO NELL' EMILIA, a town of North Italy, capital of the province of same name, 15 miles w.n.w. Modena.—The province of Reggio lies between those of Parma on the west and Modena on the east; area, 877 sq. miles; pop. 259,793.

REGIL'LUS, anciently a small lake of Italy, in Latium, to the southeast of Rome (site uncertain), celebrated for a great battle between the Romans and Latins in B.C. 496.

REGIMENT, a body of regular soldiers forming an administrative division of an army, and consisting of one or more battalions of infantry or of several squadrons of cavalry, commanded by a colonel and other officers. A regiment is the largest permanent association of soldiers, and the third subdivision of an army corps, several regiments going to a brigade, and several brigades to a division. These combinations are temporary, while in the regiment the same officers serve continually, and in command of the same body of men. The strength of a regiment may vary greatly, as each may comprise any number of battalions.

REHAN (rē'an), Ada, American actress, was born in Limerick, Ireland, in 1860, and was brought to the United States when about six years old. Her greatest rôles are those of Rosalind in *As You Like It*, Katharine in *The Taming of the Shrew*, Viola and Lady Teazle. Among her parts were those of Peggy in *The Country Girl*, Kate Verity in *The Squire*. She was Maid Marian in *Tennyson's Foresters*, and Roxane in *Cyrano de Bergerac*. Miss Rehan had great success in Germany, France and England.

REICHSTAG (rihs'táh), the imperial parliament of Germany, which assembles at Berlin.

REINDEER

REID (rēd), Capt. Mayne, born in the north of Ireland in 1819, died 1883. His love of adventure took him to America, where he traveled extensively as hunter or trader; joined the United States army in 1845 and fought in the Mexican war. He afterward returned to London, where he became well known as a writer of thrilling juvenile stories, many of them based on his American experiences, such as the *Rifle Rangers*, *Scalp Hunters*, the *War Trail*, the *Headless Horseman*, etc.

REID, Whitelaw, American journalist and statesman, was born in Xenia, Ohio, in 1837. He served as correspondent of the *Cincinnati Gazette* during the civil war, was present at Shiloh, Gettysburg, and elsewhere, and was afterward chosen librarian of the house of representatives (1863-66). He joined the staff of the *New York Tribune*, and in 1872, became its editor and principal owner. He declined the appointment as minister to Germany but accepted the nomination for vice-president (1892) and the appointment of minister to France (1889-92) and special ambassador to Queen Victoria's jubilee (1897). He was a member of the peace commission that terminated the Spanish war (1898), and special ambassador to Great Britain for the coronation of Edward VII. (1902).

REINDEER (rān'dēr), a species of deer found in the northern parts of Europe and Asia. It has branched, recurved, round antlers, the summits of which are palmated; the antlers of the male are much larger than those of the female. These antlers, which are annually shed and renewed by both sexes, are remarkable for the size of the branch which comes off near the base, called the brow antler. The body is of a thick



Reindeer.

and square form, and the legs shorter in proportion than those of the red-deer. Their size varies much according to the climate, those in the higher arctic regions being the largest; about 4 feet 6 inches may be given as the average height of a full-grown specimen. The reindeer is keen of sight, swift of foot, being capable of maintaining a speed of 9 or 10 miles an hour for a long time, and can easily draw a weight of 200 lbs., besides the sledge to which they are usually attached when used as beasts of draught. Among the Laplanders the reindeer is a substitute for the horse, the cow, and the sheep, as he

furnishes food, clothing, and the means of conveyance. The caribou of North America, if not absolutely identical with the reindeer, would seem to be at most a well-marked variety of it.

REINDEER MOSS, a lichen, which constitutes almost the sole winter food for reindeer, etc., in high northern latitudes, where it sometimes attains the height of 1 foot. It is also found in the moors and mountains of Britain. Its taste is slightly pungent and acrid, and when boiled it forms a jelly possessing nutritive and tonic properties.

RELATIVE RANK in the Army and Navy. See Navy and Army Relative Rank in.

RELICS, remains of saints and martyrs or objects connected with them, and especially memorials of the life and passion of our Lord, to which worship or a special veneration is sanctioned and practised both in the Roman Catholic and Greek churches. The doctrine of the Roman Catholic church in regard to relics was fixed by the council of Trent, which decreed in 1563 that veneration should be paid to relics as instruments through which God bestows benefits on men; a doctrine which has been rejected by all Protestant churches. The veneration of relics is not peculiar to Christianity, but has found a place in nearly every form of religion. Buddhism is remarkable for the extent to which relic-worship has been carried init.

RELIEF, in sculpture and architecture, is the protection of a figure above or beyond the surface upon which it is formed. According to the degree of projection a figure is described as in high, middle, or low relief. High relief (alto-rilievo) is that in which the figures pro-



High relief—The Rondanini mask of Medusa in the Glyptothek, Munich—illustrating the late beautified type of the Gorgon.

ject at least one-half of their apparent circumference from the surface upon which they are formed; low relief (bassorilievo) consists of figures raised but not detached from a flat surface; while middle relief (mezzo-rilievo) lies between these two forms.

RELIGION, the feeling of reverence which men entertain toward a Supreme Being or to any order of beings conceived by them as demanding reverence from the possession of superhuman control over the destiny of man or the powers of nature; more especially the recognition of God as an object of worship, love, and

obedience. The common use of the term, applies it to a body of doctrines handed down by tradition, or in canonical books, and accompanied by a certain outward system of observances or acts of worship. In this sense we speak of the Jewish, the Christian, the Hindu, etc., religions. Religions in this sense are divided into two great classes, polytheistic and monotheistic; that is, those recognizing a plurality of deities and those that recognize but one. A dualistic class may also be established, in which two chief deities are recognized, and a henotheistic, in which there are one chief and a number of minor deities. In some religions magic, fetishism, animal worship, belief in ghosts and demons, etc., play an important part. The most remarkable religious conquests in history are that of Judaism, which effected the establishment of a national religion, originally that of a single family, in a hostile territory by force of arms and expulsion or extinction of the previous inhabitants; that of Christianity, which, by the power of persuasion and in the midst of persecution, overthrew the polytheism of the most enlightened nations of antiquity; that of Mohammedanism, which, partly by persuasion, but more by force, established itself on the site of the eastern empire of Christianity, and extended its sway over a population partly idolatrous and partly Christian; that of Buddhism, which, being expelled by persecution from India, where it had widely disseminated itself by conversion, spread itself also by moral suasion over the larger portion of Eastern Asia. All these religions, with the exception of Buddhism, which may perhaps be considered atheistic, are monotheistic systems.

Various estimates have been made of the diffusion of the various religious creeds over the world. These are necessarily very loose and often differ widely from each other. A recent estimate is the following:

Roman Catholics.....	229,000,000
Protestants.....	153,000,000
Eastern Churches.....	112,000,000
Mohammedans.....	194,000,000
Buddhists.....	400,000,000
Brahmanists.....	208,000,000
Followers of Confucius.....	80,000,000
Sinto Religion.....	14,000,000
Jews.....	7,000,000

RELIGIOUS LIBERTY, or **LIBERTY OF CONSCIENCE**, is the recognition and assertion by the state of the right of every man, in the profession of opinion and in the outward forms and requirements of religion, to do or abstain from doing whatever his individual conscience or sense of right suggests. Religious liberty is opposed to the imposition by the state of any arbitrary restrictions upon forms of worship or the propagation of religious opinions, or to the enacting of any binding forms of worship or belief. The limit of religious liberty is necessarily the right of the state to maintain order, prevent excesses, and guard against encroachments upon private right. In the organization of civil and ecclesiastical government which prevailed from Constantine to the Reformation persecution was in general only limited by dissent, and universal submission to the dominant

church became the condition of religious peace throughout Christendom, while religious liberty was unknown. The contest of opinion begun at the Reformation had the effect of establishing religious liberty, as far as it at present exists, but the principle itself was so far from being understood and accepted in its purity by either party that it hardly suggested itself even to the most enlightened reasoners of that age. In Great Britain even, civil liberty, jealously maintained, was not understood, by the dominant party at least, to import religious liberty. Active measures of intolerance were adopted against Dissenters in the reign of Queen Anne. Even in the reign of George III. conditions were attached to the toleration of Dissenting preachers; and civil enactments against Roman Catholics have been repealed only within Victoria's reign. Religious liberty was introduced in Prussia by Frederick the Great, but controvened by his immediate successor. The state at present in Prussia, without, perhaps, actually dictating to private individuals, maintains a vigilant control over ecclesiastical organization, the education of the clergy, and all public matters connected with religion. Religious liberty has only been established in Austria under the present monarch. Italy first enjoyed the same advantage under Victor Emanuel II. The government of France, even since the revolution, has always been of a paternal character, but practically religious liberty exists in France. In Spain, in the days of its power the most bigoted state in Europe, restricted liberty of worship was allowed only in 1876. Religious persecution was actively conducted against the Roman Catholics in Russia during the reign of the emperor Nicholas I., and full religious liberty does not yet exist. Since the Crimean war religious liberty has been recognized in Turkey. Toleration has thus been slowly advancing in Europe since the Reformation, and its recent progress has been extensive; yet even in the most advanced countries the state of public opinion on this subject is still far from being satisfactory.

REM'BRANDT, in full, Rembrandt Hermansz Van Ryn, the most celebrated painter and etcher of the Dutch school,



Rembrandt Van Ryn.

was born in 1606 at Leyden, where his father was a well-to-do miller. His eminence in portraiture may especially be noted in portrait-groups in particular.

REMENYI

His artistic development may be broadly divided into three periods. To the first of these (1627-39), which shows less mastery than the succeeding two, belong his *St. Paul, Samson in Prison, Simeon in the Temple, Lesson in Anatomy* (Tulp the anatomist), and various character portraits of his wife as *Queen Artemisia, Bathsheba, the Wife of Samson*, etc. To his middle period (1640-54), belong *The Night Watch, The Woman taken in Adultery, Tobit and his Wife, The Burgomaster and his Wife, Descent from the Cross, Portrait of Coppenol, Bathsheba, and Woman Bathing*. Among the works of his last period (1655-68) may be mentioned *John the Baptist Preaching, Portrait of Jan Six, The Adoration of the Magi, the Syndics of Amsterdam*, and various portraits of himself. His etchings in technique and deep suggestion have not yet been equalled. He was the first and as yet the greatest master of this department of art. Of his works there are about 280 paintings and 320 etchings extant and accessible, dating from 1625 to 1668. He died in 1669.

REMENYI (ré'mān-yē), Eduard, Hungarian violin virtuoso, was born at Heves, in 1830. He was appointed solo violinist to Queen Victoria in 1853. He afterward visited the United States, Canada, Mexico, China, Japan, France, and Germany. He ranked among the foremost musical artists of his day. He died while on an American concert tour in 1898.

REMINGTON, Frederick, American sculptor, artist, and author, born in 1861 at Canton, N. Y. His pictures of western subjects are very popular. His statuettes include "*The Broncho Buster*" and "*The Wounded Bunkie*." They are spirited bronzes, executed with skill, and his horses are very fine. His stories, illustrated by himself, include *Pony Tracks, Crooked Trails, Sundown Leflare, Men with the Bark on, and John Ermine of the Yellowstone*.

REMINGTON, Philo, American manufacturer and inventor, born at Litchfield, N. Y., in 1816. During the civil war the Remingtons supplied small arms to the federal government. Soon afterward they began to manufacture the breech-loading rifle which bears their name. In 1873 the firm secured the right to one of the first typewriters. Both rifles and typewriters have since passed into other hands. He died in 1889.

REMITTENT FEVER, a fever which suffers a decided remission of its violence during the course of the twenty-four hours, but without entirely leaving the patient. It differs from an intermittent fever in this, that there is never a total absence of fever. Remittent fever is severe or otherwise according to the nature of the climate in which the poison is generated. The autumnal remittents of temperate climates are comparatively mild, while the same fever in the tropics is often of a very severe type, and not unfrequently proves fatal. The period of remission varies from six to twelve hours, at the end of which time the feverish excitement increases, the exacerbation being often preceded by a feeling of chilliness. The abatement of the

fever usually occurs in the morning; the principal exacerbation generally takes place towards evening. The duration of the disease is generally about fourteen days, and it ends in a free perspiration, or may lapse into a low fever. This fever is often cured by the administration of quinine, which should be given at the commencement of the remission. A simple yet nourishing diet must also be attended to. No stimulants must be allowed.

Rem'ora, a genus of fishes included in the Goby family, and of which the common remora, or sucking-fish is the typical example. These fishes have on the top of the head a peculiar sucking-disc, composed of a series of cartilaginous plates arranged transversely, by means of which they attach themselves to other fishes or to the bottoms of



Remora.

vessels. The common remora attains an average length of 1 foot and possesses a general resemblance in form to the herring. It is common in the Mediterranean sea and in the Atlantic ocean. Other species are of larger size. The ancients attributed to the remora the power of arresting and detaining ships in full sail.

REMUSAT (rā-mu-zā), Charles François Marie, Comte de, politician and man of letters, was born at Paris 1797, died 1875. His works include several on English subjects, such as *L'Angleterre au XVIII. Siècle, Bacon, Lord Herbert of Cherbury, Histoire de la Philosophie en Angleterre depuis Bacon jusqu'à Locke*. His mother, Claire Elizabeth de Vergennes, Comtesse de Rémusat (born 1780, died 1824), was a very remarkable woman. Her essay on *Female Education*, published after her death, received an academic couronne, and her *Mémoires*, published in 1879-80, are particularly valuable for the light which they throw on the court of the first empire.

RENAISSANCE, a term applied, in its more specific sense, to a particular movement in architecture and its kindred arts, but in a general sense to that last stage of the middle ages when the European races began to emerge from the bonds of ecclesiastical and feudal institutions, to form distinct nationalities and languages; and when mediæval ideas became largely influenced by the ancient classic arts and literature. It was a gradual transition from the middle ages to the modern, characterized by a revolution in the world of art and literature brought about by a revival and application of antique classic learning. The period was also marked by a spirit of exploration of lands beyond the sea, by the extinction of the scholastic philosophy, by the new ideas on astronomy promulgated by Copernicus, and by the

RENNET

invention of printing and gunpowder, etc.

RENAISSANCE ARCHITECTURE, a style which originated in Italy in the first half of the 15th century, and afterward spread over Europe. Its main characteristic is a return to the classical forms and modes of ornamentation which had been displaced by the Byzan-



Renaissance sculpture—The "David" of Michelangelo, in the Accademia, Florence, Italy.

tine, the Romanesque, and the Gothic.

RENAN (rê-nān), Joseph Ernest, orientalist, historian, and essayist, was born at Tréguier, in Brittany, February 27, 1823. In 1862 he was appointed professor of Hebrew, Chaldee, and Syriac in the Collège de France, but the sceptical views manifested in his *Life of Jesus* (1863) raised an outcry against him, and he was removed from his chair, to be restored again, however, in 1871. This work, the publication of which caused intense excitement throughout Europe, was the first part of a comprehensive work on the *History of the Origins of Christianity* (*Historie des Origines du Christianisme*), which includes *Les Apôtres, St. Paul, L'Antéchrist, Les Evangiles, L'Eglise Chrétienne*, and *Marc Aurèle*, all written from the sceptical stand-point. He became a member of the Academy in 1878, and rector of the Collège de France in 1883. Renan's latest important work was the *History of the People of Israel* (1887-94) five vols.). He died in 1892.

RENFREW, or **RENFREWSHIRE**, a county of Scotland, bounded by Ayrshire, Lanarkshire, Dumbartonshire, and the river and Firth of Clyde; area, 156,785 acres, of which about 95,000 acres are cultivated. Pop. 268,418. The town of Renfrew is an ancient royal and parliamentary burgh, 6 miles w.n.w. of Glasgow, close to the Clyde. Pop. 9296.

RENNES (renn), a city of France, formerly capital of Brittany, at present capital of the department of Ille-et-Vilaine, situated at the confluence of the rivers Ille and Vilaine. Pop. 74,006.

RENNET, the prepared inner surface

of the stomach of a young calf. It contains much pepsin, and has the property of coagulating the casein of milk and forming curd. It is prepared by scraping off the outer skin and superfluous fat of the stomach when fresh, keeping it in salt for some hours, and then drying it. When used a small piece of the membrane is cut off and soaked in water, which is poured into the milk intended to be curdled.

RENT, in the strict economic sense, the payment which, under conditions of free competition, an owner of land can obtain by lending out the use of it to others. This will be found to consist of that portion of the annual produce which remains over and above the amount required to replace the farmer's outlay, together with the usual profits.

Rent, as a legal term, is the consideration given to the landlord by a tenant for the use of the lands or subjects which he possesses under lease. There is no necessity that this should be, as it usually is money; for capons, horses, corn, and other things, may be, and occasionally are, rendered by way of rent; it may also consist in services or manual operations. It is incidental to rent that the landlord can distrain—that is, seize and sell the tenant's chattels in order to liquidate the rent. Sometimes the owner transfers to another by deed or otherwise the right to a certain rent out of the lands, that is termed a rent-charge, and the holder of it has power to distrain for the rent, though he has no right over the lands themselves.

REPEAT, in music, a sign that a movement or part of a movement is to be played or sung twice.

REPLEVIN, in law, is an action brought to recover possession of goods illegally seized, the validity of which seizure it is the regular mode of contesting.

REP'LICA, in the fine arts, is the copy of a picture, etc., made by the artist who executed the original.

REPOUSSE (rè-pō'sā), a kind of ornamental metal-work in relief. It resembles embossed work, but is produced by beating the metal up from the back, which is done with a punch and hammer the metal being placed upon a wax block. By this means a rude resemblance to the figure to be produced is formed, and it is afterward worked up by pressing and chasing the front surface. The finest specimens of this style are those of Benvenuto Cellini of the 16th century.

REPRESENTATIVE GOVERNMENT, is that form of government in which either the whole of a nation, or that portion of it whose superior intelligence affords a sufficient guarantee for the proper exercise of the privilege, is called upon to elect representatives or deputies charged with the power of controlling the public expenditure, imposing taxes, and assisting the sovereign in the framing of laws. See Constitution.

REPRIEVE (re-prēv'), the suspension of the execution of the sentence passed upon a criminal for a capital offense. A reprieve may be granted in various ways: First, by the mere pleasure of the sovereign; second, when the judge is not satisfied with the verdict, or any favorable circumstance appears in the crimi-

nal's character; third, when a woman capitally convicted pleads pregnancy; and lastly, when the criminal becomes insane.

REPROBATION, in theology, is the doctrine that all who have not been elected to eternal life have been reprobated to eternal damnation. This doctrine was held by Augustine and revived by Calvin; but most modern Calvinists repudiate it in the sense usually given to it.

REPRODUCTION, the process by which animals perpetuate their own species or race. Reproduction may take place in either or both of two chief modes. The first of these may be termed sexual, since in this form of the process the elements of sex are concerned—male and female elements uniting to form the essential reproductive conditions. The second may be named asexual, since in this latter act no elements of sex are concerned. The distinctive character of sexual reproduction consists in the essential element of the male (sperm-cell or spermatozoon) being brought in contact with the essential element of the female (germ-cell, ovum, or egg), whereby the latter is fertilized or impregnated, and those changes thereby induced which result in the formation of a new being. Whether these elements, male and female, be furnished by one individual or by two—or in other words whether the sexes be situated in separate individuals or not—is a fact of immaterial consequence in the recognition and definition of the sexual form of the process. The reproductive process, therefore, may be (I) Sexual, including (A) Hermaphrodite or Monœcious parents possessing male or female organs in the same individual, and these may be (a) self-impregnating (for example, the tape-worm), or (b) mutually impregnating (for example, the snail); and (B) Diœcious parents, which may be (1) Oviparous (for example, most fishes, birds, etc.), (2) Ovo-viviparous (for example, some amphibians and reptiles), or (3) Viviparous (for example mammals). Or the reproductive process may be (II.) Asexual, including the processes of (A) Gemmation or budding (internal, external, continuous, or discontinuous), and (B) Fission (transverse, longitudinal, irregular).

The most perfect form of the reproductive process is best seen in the highest or vertebrate animals, where the male elements are furnished by one form, and the female elements by another. The male element, with its characteristic sperm-cells or spermatozoa, is brought into contact with the female ova in various ways. The ova when inated may undergo development external to the body of the parent, and be left to be developed by surrounding conditions (as in the eggs of fishes); or the parent may (as in birds) incubate or hatch them. Those forms which thus produce eggs from which the young are afterward hatched are named oviparous animals. In other cases (as in the land salamanders, vipers, etc.) the eggs are retained within the parent's body until such time as the young are hatched, and these forms are hence named ovo-viviparous: whilst (as in mammalia alone)

the young are generally completely developed within the parent's body, and are born alive. Such animals are hence said to be viviparous. In the higher mammals, which exhibit the viviparous mode of reproduction in fullest perfection, the mother and embryo are connected by a structure consisting partly of foetal and partly of maternal tissues, and which is known as the placenta (See Placenta.) In tape-worms we find similar examples of normal hermaphrodite forms. Each segment or proglottis of the tape-worm—which segment constitutes of itself a separate zooid or part of the compound animal—contains a large branching ovary, developing ova or eggs, and representing the female organs, and also the male organ or testis. These organs between them produce perfect or fertilized eggs, each of which under certain favorable conditions is capable of developing into a new tape-worm. The snails also form good examples of hermaphrodite animals and illustrate organisms which require to be mutually impregnated in order to produce fertilized eggs—that is to say, the male element of one hermaphrodite organism must be brought in contact with the female element of another hermaphrodite form before the eggs of the latter can be fecundated.

REPTILES, or REPTILIA, a class of vertebrates, constituting with the birds, to which they are most closely allied, Huxley's second division of vertebrates, Sauropsida. Reptiles, however, are generally regarded as occupying a separate place in the animal kingdom, between birds and amphibians. Reptiles differ from amphibians chiefly in breathing through lungs during the whole period of their existence; and from birds in being cold-blooded, in being covered with plates or scales instead of feathers, and in the forelegs (as far, at least, as living reptiles are concerned) never being constructed in the form of wings.

The class may be divided into ten orders, four of which are represented by living forms, while six are extinct. The living orders are the Chelonia (tortoises and turtles), the Ophidia (serpents and snakes), the Lacertilia (lizards), and Crocodilia (crocodiles and alligators). The extinct orders are: Ichthyopterygia (Ichthyosaurus), Sauropterygia (Plesiosaurus), Anomodontia (Rhynchosaurus, etc.), Pterosauria (Pterodactylus), Deinosauria (Megalosaurus, etc.), and Theriodontia. The class is also divided into two sections, Squamata and Loricata, according as the exoskeleton consists simply of scales, or of bony plates in addition to the scales.

The exo-skeleton varies greatly in its development throughout the class. As in the tortoises and turtles and crocodiles it may attain, either separately or in combination with the endo-skeleton, a high development. In serpents and many lizards it is moderately developed, while in some lizards the skin is comparatively unprotected. The skeleton is always completely developed and ossified. The vertebral column in the quadrupedal forms is divided into four or five regions, less distinctly differentiated, however, than in the mammals. The

ribs differ considerably in their mode of attachment to the vertebrae, but are always present, and in a state of greater development than in the amphibians. The body, except in the case of the tortoises, is of an elongated form. The limbs are very differently developed in the different species. In the serpents and some lizards they are completely wanting, or atrophied; in other lizards they are rudimentary; while in the remainder of the class sometimes the anterior and sometimes the posterior limbs are developed, and not the others. In no case are the limbs developed to the extent to which they are developed in birds and quadrupeds, these members seldom being of sufficient length to keep the body from the ground. In some of the forms, living or extinct, the limbs are modified for swimming or for flight. The lower jaw is connected with the skull through the intervention of a quadrat bone, and, as this often projects backward, the opening of the mouth is very great, and may even extend beyond the base of the skull. Teeth, except in the turtle and tortoises, are present, but are adapted rather for seizing and holding prey than masticating food, and, except in the crocodiles, are not sunk in sockets. The skull possesses a single occipital condyle, by means of which it articulates with the spine. The brain is small compared with the size of the skull. The muscular system is developed more like that of the birds and mammals than that of the amphibians or fishes. The intestinal tract is generally differentiated into an oesophagus, stomach, small intestine, and large intestine. It terminates in a cloaca, which is also common to the efferent ducts of the urinary and generative systems. In some forms (as snakes) the stomach, like the gullet, is capable of great distention. The heart has only three cavities, viz.: two separate auricles and a single ventricular cavity, usually divided into two by an incomplete partition. Respiration is always performed by the lungs, which are highly organized, and often attain a great size. The ova are in general retained within the body of the parent until the development of the young has proceeded to a greater or less extent, and then expelled and left to the heat of the sun; but in some forms (as snakes and lizards) they are hatched in the interior of the body. Reptiles are found in greatest number, and in most typical form and variety, in the warm or tropical regions of the earth. During winter, or in the colder seasons of the year, most reptiles hibernate, and snakes are notable as periodically moulting their skin or epidermis. See the different orders in separate articles.

REPUB'LIC, a constitution in which the supreme power in the state is vested, not in a hereditary ruler, but in the citizens themselves. According to the constitution of the governing body a republic may therefore vary from the proudest aristocracy to the most absolute democracy. In the small states of ancient Greece the supreme power was vested in the whole body of the citizens, who met in common assembly to enact their laws. In the oligarchic republics

of Genoa and Venice the supreme power was consigned to the nobles or a few privileged individuals. In all modern republics the representative system prevails. Besides the diminutive republic of San Marino, in Italy, and Andorra, on the south side of the Pyrenees the only republics in Europe at the present day are those of Switzerland and France. Switzerland has been a republic ever since it liberated itself from German rule; and France has been thrice a republic—from 1793 to 1804, from 1848 to 1852, and from 1870 to the present time. Holland was a republic from the separation of the seven provinces from Spain until 1815; Great Britain was nominally a republic from 1649 to 1660; Spain possessed a republican government in 1868-69, and in 1873-74. In the New World the republican form of government prevails universally among the independent states, the most important of all the republics there being the United States. The United States, like Switzerland, is a federative republic, consisting of a number of separate states bound together by a treaty, and having a central government, with power to enact laws binding on all the citizens. Mexico has been a republic since 1824, except during the short-lived empire from 1863 to 1867. Brazil has only been a republic since November, 1889.

REPUBLICAN PARTY, in United States politics, a name first applied to the party which favored a strong central government, not acting through the states, but directly upon the people; opposed to the democratic party, which maintained the rights of individual states. The party was latterly identified with the anti-slavery movement, and was the party of the north in the civil war. It is strongly protectionist. Since 1860 when Abraham Lincoln was elected by the Republicans, with the exception of the years 1884-88, 1892-96, when Grover Cleveland was elected by the Democrats, the Republicans have been successful in electing their candidate for the presidency.

REPUDIATION, a refusal on the part of a government to pay the debts contracted by the governments which have preceded it. Repudiation has sometimes been resorted to by the smaller American republics, and by some of the United States, and in Europe there are also instances of a similar kind.

REPULSION, in physics, is a term often applied to the action which two bodies exert upon one another when they tend to increase their mutual distance. It was formerly thought that there were two forces, attraction and repulsion, which balanced and counteracted each other; but it is now known that all apparent repulsion is merely a difference of attractions.

RESERVE, in military matters, has several significations. In battle the reserve consists of those troops not in action, and destined to supply fresh forces as they are needed, to support those points which are shaken, and to be ready to act at decisive moments. The reserve of ammunition is the magazine of warlike stores placed close to the scene of action to allow of the supply actually in the field being speedily re-

plenished. The term reserves is also applied to those forces which are liable to be called into the field on great emergencies, for the purposes of national defence; which has received a military training but follow the ordinary occupations of civil life, and do not form part of the standing army. Such reserves now form a part of all national troops organized on a great scale.

RESERVE, in banking and insurance, that portion of capital which is set aside to meet liabilities, and which, in banking, is therefore not employed in discounts or temporary loans.

RESERVOIR (rez'ér-vwâr), an artificial basin in which a large quantity of water is stored. The construction of a reservoir often requires great engineering skill. In the selection of a site the great object should be to choose a position which will give the means for collecting a large supply of rainfall with as little recourse as possible to artificial structures or excavations. The embankments or dams may be constructed either of masonry or earth-work, but the latter is the more usual, as it is generally the more economical method. Reservoirs in which the dams are built of earth-work must be provided with a waste-weir, to admit of the surplus water flowing over; in the reservoirs of which the dams are built of masonry there is no necessity for a waste-weir, as then the water may be allowed to overflow the wall, there being no fear of its endangering the works. The outlet at the bottom, by which the water to be used is drawn off from the reservoir, may consist either of a tunnel, culvert, or iron pipes provided with suitable sluices. Distributing reservoirs for cities are generally built of masonry. They are placed high enough to command the highest part of the town, and are capacious enough to contain half a day's supply, their chief use being to store the surplus water during the night.

RESINS, a class of vegetable substances insoluble in water, soluble in alcohol, and easily softened or melted by heat. Resins are either neutral or acid; they are transparent or translucent; they have generally a yellow-brown color; are sometimes elastic, but more generally friable and hard. They become electric when rubbed. Resins may be divided into three classes: (1) Those which exude spontaneously from plants, or from incisions in the stems and branches. They are generally mixtures of gum-resins and volatile oils. The principal resins belonging to this class are benzoin, dragon's-blood, Peru balsam, storax, copaiba, copal, elemi, guaiacum, jalap, lac, myrrh, sandarach, and turpentine. (2) Resins extracted from plants by alcohols; they generally contain definite carbon compounds. The principal resins belonging to this class are gum ammoniacum, angelicaroot, Indian hemp, cubebs, manna, and squill. (3) Fossil resins, occurring in coal or lignite beds, amber, asphalt-copaline, fossil caoutchouc, etc.

RESISTANCE, Electrical, the opposition which a conductor offers to the flow of electricity, the conductor being removed so far from neighboring conductors that their action will be very

small, and maintained at the temperature of 0° C. The unit of resistance is called an ohm.

RES'ONANCE, in acoustics, a strengthening of sound. When a person speaks in an empty room the walls reflect the words. Suppose we have only to deal with one reflecting surface, at a distance of 112.5 feet from the speaker; there will be an interval of one-fifth of a second between the word and its echo, and the sound will be distinguished from its reflection; for any shorter distance the echo will merely strengthen the sound. Resonance includes such strengthening of sound as occurs in sounding-boards and the bodies of musical instruments.

RESPIRATION, the act of respiring or breathing. Respiration is that great physiological function which is devoted to the purification of the blood by the removal, through the media of the breathing organs, of carbonic acid and other waste products, and at the same time to the revivifying of the blood by the introduction of the oxygen of atmospheric air. It is thus partly excretory and partly nutritive in its character. The other waste products, besides carbonic acid, which are given off in the process of animal respiration are water, ammonia, and organic matters; the carbonic acid is by far the most important.

In man and the higher animals respiration is carried on by the breathing organs or lungs. The blood is conveyed to the breathing organs by special vessels, the right side of the heart in birds and mammals being exclusively employed in driving blood to the lungs for purification. The blood is sent through the pulmonary or lung capillaries in a steady stream, and passes through these minute vessels at a rate sufficient to expose it to the action of the oxygen contained in the air-cells of the lungs. The essential part of the function of respiration, namely, the exchange of carbonic acid gas for oxygen, thus takes place in the lung, where the dingy-hued venous blood becomes converted into the florid red arterial blood. Respiration includes the physical acts of inspiration and expiration, both involuntary acts, although they may be voluntarily modified. From fourteen to eighteen respiratory acts take place per minute, the average quantity of air inhaled by a healthy adult man being about 30 cubic inches, a slightly smaller quantity being exhaled. This definite volume of air which ebbs and flows is termed tidal air. The quantity (about 100 cubic inches) which may be taken in a deep inspiration, in addition to the tidal air, is termed supplemental air. The quantity of air (75 to 100 cubic inches) remaining in the chest after an ordinary expiration has expelled the tidal air, is named supplemental or reserve air, and this may be in greater part expelled by a deeper expiration; while a quantity of air, also averaging from 75 to 100 cubic inches, always remains in the lungs after the deepest possible expiratory effort, and cannot be got rid of. This latter quantity is therefore approximately named residual air. The difference in the mode of breathing between the two sexes is clearly per-

ceptible. In man it is chiefly abdominal in its character; that is to say, the lower part of the chest and sternum, together with the abdominal muscles, participate before the upper portions of the chest in the respiratory movements; while in women the breathing movements are chiefly referable to the upper portions of the chest. In women, therefore, breathing is said to be pectoral.

Every volume of inspired air loses from 4½ to 5 per cent of oxygen and gains rather less carbonic acid. The quantity of carbonic acid given off varies under different circumstances. More carbonic acid is excreted by males than by females of the same age, and by males between eight and forty than in old age or in infancy. An average healthy adult man will excrete more than 8 oz. of carbon in 24 hours. Hence the necessity for repeated currents of fresh air in meeting places and places of public entertainment, in halls and in churches, and for the proper ventilation of sleeping apartments. The breathing of an atmosphere vitiated by organic matter and carbonic acid results in imperfect oxygenation of the blood, is accompanied or followed by headaches, drowsiness, and lassitude, and is the source of many serious and even fatal disorders.

While in man and the more highly organized animals respiration is carried on by the lungs, in fishes it is effected by the gills. The essential feature of any breathing organ is a thin membrane, having the blood on one side and air, or water containing air, on the other; and the essential feature of respiration is an interchange of products between the blood and the atmosphere, oxygen passing from atmosphere into the blood, and carbonic acid and organic matters from the blood into the atmosphere. In the protozoa no respiratory organs are specialized, but the protoplasm of which the bodies of these animals are composed has doubtless the power of excreting waste matters, as well as of absorbing nutritive material. Even in comparatively high organisms, where no specialized breathing organs are developed the function of respiration may be carried on by the skin or general body surface—the integument being, as in the highest forms, intimately correlated in its functions to the breathing process. Thus in earthworms, lower crustacea, etc., the breathing appears to be solely subserved by the body-surfaces.

Respiration goes on in plants as well as in animals, the plant in the presence of light exhaling oxygen and inhaling carbonic acid, and thus reversing the action of the animal.

RESPIRATION, Artificial. See Drowning.

RESPIRA'TOR, a mouth-covering, which gives warmth to the air inhaled, and is used by persons having delicate lungs. It is constructed of a series of layers of very fine silver or gilt wires placed closely together, which are heated by the exhalation of the warm breath, and in turn heat the cold air before it is inhaled. Other respirators, designed to exclude smoke, dust, and other noxious substances, are used by firemen, miners, cutlers, grinders, and the like.

RESPIR'ATORY SOUNDS, in medicine, the sounds made by the air when being inhaled or exhaled, as heard by the ear applied directly to the chest, or indirectly through the medium of the stethoscope. The respiratory sounds are of the highest importance in the diagnosis of diseases of the chest and bronchial tubes.

REST, in music, an interval of silence between two sounds, and the mark which denotes such interval. Each note has its corresponding rest. See Music.

RESTIA'CEÆ, a natural order of plants allied to the Cyperaceæ or sedges, and confined to the southern hemisphere, being found chiefly in South Africa and Australia. They are herbs or undershrubs, with matted roots which bind shifting soil, hard wiry stems, simple narrow leaves, the sheaths of which are usually split, and inconspicuous brown rush-like panicles of flowers.

RESTORATION, in English history, the re-establishment of Charles II. on the throne, May 29, 1660. The restoration was held as a festival in the Church of England till 1859.

RESURRECTION, the rising again of the body from the dead to be reunited to the soul in a new life. It has formed a part of the belief of the Christian church since its first formation, and has been embodied as an article to each of the creeds. There are traces to be found of such a belief among heathen nations from a very early period. There can be little doubt that the Jews, particularly those of later times, held the doctrine, though it would be difficult to point to any express indication of it in the Old Testament. It appears, however, to be alluded to in Isaiah xxvi. 19, and is distinctly affirmed in Daniel, chap. xii. 1-3. That the belief in the resurrection was generally held among the Jews at the time of Christ is evident, particularly from the position occupied by the Sadducees, a sect having as its most characteristic feature the denial of the resurrection. Beyond doubt, however, it was the gospel that "brought life and immortality to light." At best the notions of a resurrection and future state current prior to the advent of Christ were dim and undefined, and it remained for him to set them in a full clear light, and give evidence and pledge of their reality, by his own resurrection. With regard to the information conveyed to us in the New Testament on the doctrine of the resurrection, we are taught that it will be universal, extending to the wicked as well as to the righteous, John v. 28, 29; Rev. xx. 13; that there shall be identity, in some sense, between the body which died and the body which shall be raised, 2 Cor. v. 10; that, as regards the resurrection of the righteous, the body, though identical, shall be wonderfully altered, Phil. iii. 21; 1 Cor. xv.; Luke xx. 35, 36; and that, as regards the time of the resurrection, it shall be at the end of this present earthly state, and that it shall be connected with the coming of our Lord to judge the world, 1 Thess. iv. 16.

Connected with this subject is the resurrection of Christ himself from the dead, the corner-stone of the Christian

system. The evidence in support of it is marked by the following characteristics: (1) The variety of circumstances under which the risen Savior appeared. (2) The circumstantiality of the testimony given by the different witnesses. (3) The simplicity and apparent truthfulness with which the witnesses described their impressions when the Savior appeared to them. (4) That the event borne witness to was completely unexpected by the witnesses; and (5) That the testimony was published to the world on the very spot where, and at the very moment when, the event was said to have happened.

RESZKE (rěsh'ke), Edouard de, Polish opera singer, brother of Jean de Reszke, was born at Warsaw in 1856. He made his first public appearance in 1876 at the Italiens in Paris, as the King in Verdi's *Aida*, which was so successful that Massenet intrusted to him the creation of *Le roi de Lahore* at La Scala in Milan. From 1880 to 1884 he sang with the Royal Italian Opera company in London, where he became famous as one of the greatest dramatic bassos of his time.

RESZKE, Jean de, Polish dramatic tenor, was born at Warsaw in 1853. In 1874 he made his début at Venice, as Alfonso in *La Favorita*, under the name of De Reschi. He made his second début before the public in 1879, this time in the tenor rôle of Robert le Diable, at Madrid. His success was instantaneous. His repertoire includes *Faust*, *Lohengrin*, *L'Africaine*, *Aida*, *Le Cid* (written for him by Massenet), *Les Huguenots*, *Elaine*, *Romeo* and *Juliet*, and *Tristan*. He is conceded to be one of the most artistic singers and actors known to the operatic stage. For many years subsequent to 1891, both the De Reszkes were favorite members of the Metropolitan Opera House Company, New York.

RETAINER, in law, the contract between a solicitor and a client, or a solicitor and counsel for professional services, and the document given by the solicitor to a counsel engaging his services. When the counsel is engaged for a particular suit the document is called a special retainer; and when he is engaged for all matters of litigation in which such party may be at any time involved, it is called a general retainer. The retainer is in all cases accompanied by a preliminary fee called a retaining fee.

RETENTION OF URINE, in medicine, a condition in which the urine cannot be expelled from the bladder at all, or only with great difficulty; to be distinguished from suppression of urine, a condition in which the bladder is empty, the urine not having been secreted by the kidneys. It may be due to some mechanical obstruction, as a calculus, a clot of blood, or a tumor, or to paralysis, etc. If not relieved by means of the catheter or otherwise it may cause rupture of the bladder and death.

RETICULATED WORK, a species of masonry very common among the ancients, in which the stones are square and laid lozenge-wise, resembling the meshes of a net, and producing quite an

ornamental appearance. It is the opus reticulatum of the Romans.

RET'INA, in anatomy, a membrane of the eye, formed by an expansion of the optic nerve, and so constituted as to receive the impressions which result in vision. See *Eye*.

RETORT', a vessel, generally of glass, used in chemistry, for distilling liquids. Retorts consist of a flask-shaped vessel, to which a long neck or beak is attached. The liquid to be distilled is placed in the flask and heat applied. The products



Ancient Roman reticulated work.

of distillation condense in the cold neck of the retort, and are collected in a suitable receiver. In gas-making, retorts of iron or fire-clay are used for distilling the coal.

RETRIEVER, a dog specially trained to fetch game which has been shot, and greatly valued by sportsmen for its sagacity in the field and in the water. The larger and more familiar breed of retrievers is formed by crossing the Newfoundland and setter; the smaller breed is formed by crossing the water-spaniel and terrier. The typical retriever is 20 or more inches high, with a stoutly-built body, strong limbs, webbed toes, and black and curly fur.

RETROGRADE, a term given to the apparent motion of a planet among the stars when it is in opposition to the motion of the sun in the ecliptic. The motion of a planet in the direction from right to left is said to be direct.

RETROGRESSION OF THE MOON'S NODES, the motion of the moon nodes—the two points in which the moon's orbit meets the plane of the ecliptic—in the direction opposite to that of the sun's motion in the ecliptic. The moon's nodes slowly change at each revolution of the moon, in the direction from left to right, and make a complete revolution round the earth in 18.6 years.

REUMONT, (roi'mont), Alfred Von, German historian, born at Aix-la-Chapelle, August 15, 1808. He died in 1887. He was the author of several valuable works on the history of Italy, including *Contributions to Italian History*, *The Carafas of Maddaloni*, *History of the City of Rome*, etc. He also wrote on the history of art.

REUNION (rā-u-ni-ōn), formerly Bourbon, an island in the Indian ocean, between Mauritius and Madagascar, 115 miles from each; area, 1127 sq. miles. It was annexed by France in 1643, and is an important French colony, now sending a representative to the chamber

of deputies, and forming practically almost a department of France. The population, which consists of creoles, negroes, Indian coolies, Chinese, Malays, etc., is 179,639.

REUSS (rois), two principalities of Central Germany, consisting of several separate territories situated between Prussia, Saxony, and Bavaria, and belonging to an older and a younger line of the family of Reuss. Reuss-Greiz, the territory of the elder line, comprises an area of 122 sq. miles, with a population of 68,396; the territory of the younger line, Reuss-Schleiz-Gera, has an area of 318 sq. miles, with a pop. of 139,210.

REUTER (roi'tër), Fritz, German humorist, was born in 1810, and educated at Rostock and Jena. His first literary venture was a volume of humorous poems in Low German (*Latüschchen* and *Riemels*, 1853), which met with extraordinary success. His greatest work is *Olle Kamellen*, a series of prose tales, which stamped him as the greatest writer of Plattdeutsch and one of the greatest humorists of the century. He died at Eisenach in 1874.

REUTER (roi'tër), Paul Julius, Baron, born at Cassel in 1816, was connected with the electric telegraph system from the beginning, and in 1849 established Reuter's News Agency at Aix-la-Chapelle. In 1865 he converted his agency into a limited liability company. In 1871 he received the title of baron from the Duke of Coburg-Gotha. He laid some important telegraphic cables. He died in 1899.

REVAL, or **REVEL**, a fortified seaport of Russia, capital of Esthonia, on a small bay in the Gulf of Finland. It is much frequented for sea-bathing. Pop. 64,578.

REVEILLE (re-vel'ye), the signal given in garrisons at break of day, by beat of drum or sound of bugle, for the soldiers to rise and the sentinels to forbear challenging until the retreat is sounded in the evening.

REVELATION, the knowledge of God and his relation to the world, given to men by God himself, and for the Christian contained in the Bible. The earliest revelations, made in the patriarchal age, were preserved till later times, and gradually enlarged during the Mosaic period by successive revelations to chosen individuals, with whom the Bible makes us acquainted under the name of prophets, from Moses to Malachi, God having finally completed his revelations through Christ.

REVELATION, Book of. See *apocalypse*.

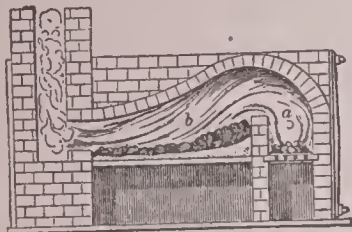
REVENUE, the income of a nation derived from taxes, duties, and other sources, for public uses. See articles on the different countries, also *Taxation*, etc.

REVENUE CUTTER, a sharp-built single-masted vessel, armed, for the purpose of preventing smuggling and enforcing the custom-house regulations.

REVERBERATORY FURNACE, a furnace in which the material is heated without coming into contact with the fuel. Between the fireplace and the bed on which the material to be heated lies, a low partition wall, called a fire-bridge, is placed. The flame passes over

REVERE

this bridge, and plays along the flat arch which surmounts the whole, reflecting or reverberating the heat downward. The reverberatory furnace gives free access of air to the material, and is em-



Section of reverberatory furnace.

ployed for oxidizing impurities in metals, and for other similar purposes.

REVERE (re-vēr'), Paul, born at Boston, Massachusetts, January 1, 1735, has earned fame by riding through Charlestown to Concord on the night of April 18, 1775, to give warning of the British expedition, which was resisted next day at Lexington and Concord; a service immortalized in Longfellow's poem, *The Midnight Ride of Paul Revere*. He had been a goldsmith and copper-plate engraver, and subsequently he set up a foundry and erected works for rolling copper at Canton, Massachusetts, still carried on by his successors as the Revere Copper company. He died May 10, 1818.

REVISED STATUTES, the acts of the legislatures of the various states and of congress. After a large number of these volumes have been issued, it is found that acts in the earlier volumes are repealed or amended by acts reported in later ones, that some have become obsolete by reason of changed conditions. Where this state of facts exists, most of the states have at some time authorized thorough revisions of their statute law. The general laws are thus collected, arranged and amended, are reenacted by the legislature and then constitute the official revised statutes of the state, superseding all original acts on the same subject. There have been several revisions of the statutes of the United States.

REVIVAL, a term applied to religious awakenings in the Christian church, and to the occurrence of extensive spiritual quickening and conversion in the general community. The first great revival in Europe was the Reformation in the 16th century, which awoke the church from the sleep of centuries. When religion had degenerated into formalism in England in the 17th century a second revival of spiritual interest was accomplished through the instrumentality of the Puritans. When the church had once more sank into a state of sloth and apathy in the 18th century, it was aroused by the preaching of Whitfield, the Wesleys, Rowland Hill, Venn, Newton, Cecil, Fletcher, and a multitude of other earnest men. Coincident with this movement was the origin of missions to the heathen. Scotland also presents several remarkable revivals. But it was reserved for recent times to witness in America and Great Britain perhaps the most remarkable religious revival which has been witnessed since the era of the Reformation. Movements

of this nature, but of limited extent, have not been infrequent in the American churches, as in 1736 and 1830; but the great revival which originated in the United States in 1858 subsequently extended to the British islands, and was experienced with more or less power throughout almost every part of the world. New York and Philadelphia were the principal centers of the movement, which became universal in the United States, embracing all denominations and all classes of society. In the summer of 1859 the revival extended to the north of Ireland, chiefly through the agency of the Presbyterian church, and from Ireland it spread to Scotland, where its power was extensively felt by the long-neglected population of the fishing villages in the east and north, and in Glasgow, Edinburgh, Aberdeen, Perth, Dundee, Paisley, Dumfries, and other large towns. Wales largely participated in this revival; the increase to the membership of its churches in one year, from June, 1859, amounting to 100,000. Various parts of England also shared in the movement. The most extraordinary revival movement of modern times, was that initiated by the two American "evangelists," D. L. Moody and Ira D. Sankey, whose respective functions it has been, to use their own words, "to preach and to sing the gospel." The movement commenced in 1873 in England, but it attained no great prominence until the arrival of the two evangelists in Edinburgh. Their ministrations in that city, and afterwards in Glasgow, Dundee, and other towns in Scotland, and also in England and Ireland, up to August, 1875, were attended daily by multitudes of people, a remarkable feature of these assemblies being the presence in great numbers of the upper ranks of society, even to members of the peerage and royal family. On their return to the United States they headed a similar movement there; and they paid a second and equally successful visit to Britain in 1883-84. Reuben Archer Torrey, clergyman and evangelist, became associated with the work of Moody, and has met with great success. In 1902-3 he visited and preached in England, Scotland, Ireland, Australia, New Zealand, Tasmania, China, Japan and India; returning to Britain in 1903-5, holding meetings in principal English and Scotch cities, including 5 months in Albert Hall, London. He preaches continually and in 1907 he held the most extraordinary and successful revival in Chicago in a vast steam tent, erected especially for the purpose. His works have been translated into French, German, Spanish, Portuguese, Chinese (2 languages), Japanese, Hindustani. The Salvation Army, which was originated in 1865 and organized under its present name in 1878, and the Volunteers of America, organized in 1896, may be regarded as permanent revival organizations. See Salvation Army. Volunteers of America.

REVOLUTION, the more or less sudden, and it may be violent, overturning of a government or political system, with the substitution of something else. The term "revolution" is applied dis-

tinctively in English history to the convulsion by which James II. was driven from the throne in 1688; and in French history to the upheaval of 1789. Subsequent French revolutions are those of 1830, 1848, 1851, and 1870-71. The American war of independence (1775-83) is often called a revolution.

REVOLVER, a description of firearm in which a number of charges contained in a revolving cylinder are, by pulling the trigger, brought successively into position and fired through a single barrel. For the introduction of the revolver in its present form we are indebted to Colonel Samuel Colt, of the United States, though repeating pistols had long been known in other countries. These were made from one mass of metal bored into the requisite number of barrels, but were so clumsy as to be almost quite useless. In Colt's weapon there is a revolving cylinder containing six chambers placed at the base of the barrel, each chamber having at its rear end a nipple for a cap. These contain the cartridges, which are put in from the front of the breech-piece and driven home by a lever ramrod placed in a socket beneath the barrel. The revolver is fired through the single barrel, the cylinder being turned by mechanism connected with the lock, until each chamber in succession is brought round so as to form virtually a continuation of the barrel. Various modifications of Colt's revolver have been introduced, with the view in some cases of increasing the rapidity and facility of firing, in



Hammerless.

others of diminishing by safeguards the risks to which inexperienced hands must ever be exposed in the use of these weapons. In the Smith and Wesson revolver one of the most recent (adopted by Austria and Russia), facility in loading is a feature, the cylinder and barrel together being pivoted to the front of the stock, so that by setting the hammer at half-cock, raising a spring-catch, and lowering the muzzle the bottom of the cylinder is turned up to receive fresh metallic cartridges. When this is done the muzzle is pressed back until the snap-catch fastens it to the back plate, and the revolver is again ready to be fired. In the latest form of this revolver the spent cartridges are thrown out of the cylinder by means of an automatic discharger. As a military weapon the revolver will, it is thought, be superseded by a repeating pistol with mechanism similar to that of magazine rifles. The revolver principle has also been applied to rifles, and to guns for

throwing small projectiles, as in the Gatling and other machine guns.

REWA KANTHA, a political agency of India, subordinate to the government of Bombay. It was established in 1821-26, and has under its control 61 separate states, great and small, on the Nerbudda, most of which are tributary to the Gaekwar of Baroda. Area, 4980 sq. miles; pop. 478,889.

REYNOLDS, Sir Joshua, English portrait-painter, was born at Plympton, Devonshire, 16th July, 1723. Among the more notable of his portraits are the Duchess of Hamilton (1758), the Duke of Cumberland (1759), Miss Palmer (1770), Mrs. Nesbitt as Circe (1781), Mrs. Siddons as the Tragic Muse (1784), the Duchess of Devonshire and Child (1786),



Sir Joshua Reynolds.

and Miss Gwatkin as Simplicity (1788). In 1768, on the foundation of the Royal academy, he was chosen president, and received the honor of knighthood; and in 1784 he was appointed principal portrait-painter to the king. As president of the Royal academy he delivered his celebrated annual Discourses on Painting, the last of which was delivered in 1790. He died unmarried February 23, 1792, and was interred in St. Paul's cathedral.

RHAMNA'CEÆ, a natural order of exogenous plants, consisting of trees or



Branch of common buckthorn with fruit.
a, female flower; b, male flower; c, leaf, showing the nervation.

shrubs, with simple, alternate, rarely opposite leaves, small greenish-yellow

flowers, a valvate calyx, hooded petals, opposite to which their stamens are inserted, and a fruit which is either dry or fleshy. This order contains about 250 known species, distributed very generally over the globe. There is a remarkable agreement throughout the order between the properties of the inner bark and the fruit, especially in several species, in which they are both purgative and emetic, and in some degree astringent. Many species, however, bear wholesome fruit; and the berries of most of them are used for dyes. The buck-thorn and jujube belong to this order.

RHEIMS, or **REIMS** (rēmz), a town of France, in the department of Marne, in an extensive basin surrounded by vine-clad hills, 82 miles e.n.e. of Paris. The principal edifices are the cathedral, erected in the 13th and 14th centuries, one of the finest Gothic structures now existing in Europe; the archi-episcopal palace (1498-1509), occupied by the French kings on the occasion of their coronation; the church of St. Remy (11th and 12th centuries), the oldest church in Rheims, the Porte de Mars, a Roman triumphal arch erected in honor of Julius Cæsar and Augustus; the town-house, of the 17th century; and several ancient mansions, particularly the hôtel of the counts of Champagne. The staple industries are the manufacture of the wine known as champagne, and of woolen fabrics, such as flannels, merinoes, blankets, etc. Since the Franco-German war it has been surrounded with detached forts, which render it a place of great strength. Pop. 107,017.

RHENISH PRUSSIA, the most westerly province of Prussia, touching w. and n. Luxemburg, Belgium, and Holland; area, 10,420 sq. miles; greatest length from n. to s. about 200 miles, greatest breadth about 90. Pop. 5,758,995, the majority of whom are Roman Catholics.

RHENISH WINES, the general designation for the wines produced in the region watered by the Rhine, and specifically for those of the Rheingau, the white wines of which are the finest in the world. The red wines are not so much esteemed, being considered inferior to those of Bordeaux. Good wines are also produced in the valleys of the Neckar, Moselle, and other tributaries of the Rhine. The vineyards are mainly between Mannheim and Bonn, and the most valuable brands of wines are those of Johannisberg, Steinberg, Hochheim, Rüdesheim, Rauenthal, Markobrunn, and Assmannshausen, the last being a red wine.

RHE'OSTAT, an instrument for measuring electrical resistances, invented by Sir Charles Wheatstone. The rheostat is very convenient for measuring small resistances; but for practical purposes, such as measuring the resistance of telegraph cables, Wheatstone's bridge (an apparatus of which there are several forms) is always used.

RHESUS MONKEY, a name for two species of monkeys, the bruh or pig-tailed monkey which inhabits the Malay peninsula, and the islands of the Indian archipelago, and is often domesticated; and a species of monkey held sacred in

India, where they swarm in large numbers about the temples.

RHET'ORIC, in its widest sense, may be regarded as the theory of eloquence, whether spoken or written, and treats of the general rules of prose style, in view of the end to be served by the composition. In a narrower sense rhetoric is the art of persuasive speaking, or the art of the orator, which teaches the composition and delivery of discourses intended to move the feelings or sway the will of others. In the wider sense rhetoric treats of prose composition in general, purity of style, structure of sentences, figures of speech, etc.; in short, of whatever relates to clearness, preciseness, elegance, and strength of expression. In the narrower sense it treats of the invention and disposition of the matter, the character of the style, the delivery or pronunciation, etc. Aristotle, Cicero, and Quintilian are the principal writers on rhetoric among the ancients; and among the English, Campbell, Blair, Whately, Spalding, and Bain.

RHEUMATISM, an ailment or set of ailments attended with sharp pains, partly neuralgic in character; and partly owing perhaps to infection with certain disease germs. Some varieties of it have so much resemblance to the gout that some physicians have considered it as not an entirely distinct disease. Rheumatism is distinguished into acute and chronic. The former is characterized by fever more or less severe, pains in the joints, which are swollen, red, and tender, and sweating. The inflammation flits from one joint to another, one joint getting well when another is attacked; and the pain may be very severe. The entire duration of an attack, if not treated, may be from two to six or ten weeks, and disease of the heart may be a consequence of this disease. Chronic rheumatism is distinguished by pain and stiffness, either stationary or shifting, in the joints, without fever. It is aggravated by damp weather, and usually is never absolutely got rid of. Acute rheumatism mostly terminates in one of these species. Rheumatism may arise at all times of the year, when there are frequent vicissitudes of the weather from heat to cold, but the spring and autumn are the seasons in which it is most prevalent; and it attacks persons of all ages, but very young people are less subject to it than adults. Obstructed perspiration, occasioned either by wearing wet clothes, lying in damp sheets or damp rooms, or by being exposed to cool air when the body has been much heated by exercise, is the cause which usually produces rheumatism.

RHINE, the finest river of Germany, and one of the most important rivers of Europe, its direct course being 460 miles and its indirect course 800 miles (about 250 miles of its course being in Switzerland, 450 in Germany, and 100 in Holland); while the area of its basin is 75,000 sq. miles. The chief towns on its banks are Constance and Bâle in Switzerland; Spire, Mannheim, Mainz, Coblenz, Bonn, Cologne, and Düsseldorf, with Worms and Strasburg not far distant, in Germany; Arnheim, Utrecht, and Leyden, in Holland. Its breadth at Bâle is 750 feet; between Strasburg and

RHINOCEROS

Spires from 1000 to 1200 feet; at Mainz 1500 to 1700 feet; and at Emmerich, where it enters the Netherlands, 2150 feet. Its depth varies from 5 to 28 feet, and at Düsseldorf amounts even to 50 feet. It is navigable without interruption from Bâle to its mouth, a distance of 550 miles, and much timber in rafts, coal, iron, and agricultural produce are conveyed by it.

RHINOCEROS, a genus of hoofed mammals, belonging to the perissodactylate or odd-toed division, allied to the elephant, hippopotamus, tapir, etc. They are large ungainly animals, having short legs, and a very thick skin, which is usually thrown into deep folds. There are seven molars on each side of each jaw; there are no canines, but there are usually incisor teeth in both jaws. The feet are furnished with three toes each, encased in hoofs. The nasal bones usually support one or two horns, which are of the nature of epidermic growths, somewhat analogous to hairs. When two horns are present the one is placed behind the other and is generally shorter than it. These animals live in marshy places, and subsist chiefly on grasses and foliage. They are exclusively confined to the warmer parts of the eastern hemisphere. The most familiar species is the one-horned or Indian rhinoceros, which, like all the Asiatic species, has the skin thrown into very definite folds, corresponding to the regions of the body. The horn is black, and usually very thick. The upper lip is very large, and is employed by the animal somewhat as the elephant uses his trunk. Though



Indian rhinoceros.

possessed of great strength it is quiet and inoffensive unless provoked. The Javanese rhinoceros is distinguished from the Indian chiefly by its smaller size. It has been trained to bear a saddle and to be driven. It occurs in Java, Sumatra, and Borneo. The Sumatran species is found in Sumatra and the Malay peninsula. It has two horns, the first being the longer and sharper. The typical African rhinoceros is found in Southern Africa generally. Like other African species it possesses no skin-folds. The horns are of very characteristic conformation, the front horn being broad and raised as on a base, sharp-pointed, and curved slightly backward, while the hinder horn is short and conical. This animal appears to be of ferocious disposition, is quick and active, and greatly feared by the natives. Other allied African species are the Keitloa or Sloan's rhinoceros, the common white rhinoceros, and the long-horned white rhinoceros. Fossil species are numerous and range from the Miocene tertiary

through the Pliocene and Post-pliocene deposits. The "woolly rhinoceros," formerly inhabited England and ranged over the greater part of Europe.

RHINOCEROS-BIRD, or **RHINOCEROS-HORNBILL**. See Hornbill.

RHIO, or **RIOUW**, a seaport belonging to the Dutch, in the Indian archipelago, on an islet 50 miles southeast of Singapore. It is the capital of a Dutch residency, comprising the islands of the Rhio archipelago and other groups as well as districts on the east coast of Sumatra. The population of the residency is estimated at 90,000. The Rhio archipelago is a group of small islands lying chiefly south and east of Singapore. Chief island Bintang.

RHODE ISLAND, one of the original thirteen States of North America, between Massachusetts, Connecticut, and the Atlantic; area, 1250 sq. miles. Rhode Island is the smallest in area of the states of the Union. The surface, which in the north is hilly and rugged, but elsewhere generally level, is divided into two parts by Narragansett bay, a fine body of water about 30 miles long by 15 miles broad, and containing several islands, and among others the one which gives the state its name. The chief rivers are the Pawtucket, the Pawtuxet, and the Pawcatuck. The climate is mild and equable, and well adapted, from its pleasant summers and temperate winters, for invalids from the south. Corn, oats, hay and forage are the most important crops. Potatoes, sweet corn, and other vegetables are grown for the local market. The minerals include coal, iron ore, and limestone; sandstone, marble, and serpentine are sufficiently common. The soil is only of indifferent fertility. Manufactures form the staple industry; they consist of cotton, woolen, worsted, and mixed textiles, jewelry, and foundry and machine-shop products. The higher education is provided for by Brown university at Providence. A compulsory education law is now in force for children from 7 to 14 for twelve weeks in the year only. The chief cities are Providence, Pawtucket, and Newport. Providence and Newport both rank as state capitals. Rhode Island is one of



Rhode Island seal.

the six New England states, and one of the original thirteen which formed the Union. The Northmen are supposed to have visited Rhode Island in

RHODES

the tenth century, and the "Old Stone Mill" at Newport has been claimed as their work. Rhode Island was first settled when Roger Williams was banished from Massachusetts bay, and settled with a few companions at "Providence Plantations," on land purchased from the Narragansett Indians probably in June, 1636. Through the influence of the Earl of Warwick, parliament granted (1644) a charter uniting the settlements as the "Incorporation of Providence Plantations in the Narragansett bay in New England."

The union effected by this instrument was of the very loosest description, but under the pressure of causes which threatened the very existence of the colony a new and much more comprehensive charter was obtained in 1663. This extraordinarily liberal instrument constituted the fundamental law of Rhode Island for the next 180 years, through a succession of vicissitudes. Massachusetts and other American colonies were withdrawn in 1686, but the efforts of the royal agent were frustrated in Connecticut and Rhode Island; and in this colony the government was simply committed temporarily to the separate towns which had constituted the colony, the charter government being peacefully resumed three years later, in 1689. Rhode Island was hardly free, during the next seventy years, from some form of conflict with the mother country over the question of charter rights; and in the steps which served to precipitate the War of Independence (1775-83) as well as in the war itself, it was among the foremost. During the revolution Newport was held (1776-79) by British troops, and in 1780 the French fleet was stationed there. The famous soldier of Rhode Island was General Nathanael Greene, who ranks easily second to Washington in generalship.

The state refused to send delegates to the convention which drew up the federal constitution, and it was not until threats of coercion had been made that the instrument was ratified, May 29, 1790. A new state constitution was adopted as a result in 1842, which has been frequently amended since. The property qualification for suffrage was not abolished until 1888, and election by a plurality has been allowed since 1893. Until 1900 the legislature met in Newport in April to canvass the vote and adjourned to Providence in January to transact business. Now all sessions are held in Providence. Since 1856 the state has been republican in national elections. Pop. 514,000.

RHODES (rôdz), a Turkish island in the Aegean sea, off the southwest coast of Asia Minor, separated from it by a channel 10 miles broad; area, 560 sq. miles. It is traversed by a mountain range, the highest point of which is 4786 feet. Pop. 30,000, of whom 20,000 are Greeks, 7000 Turks, and 1500 Jews. —Rhodes, the capital, stands at the northeastern extremity of the island, rising from the sea in the form of an amphitheater, with fortifications mainly the work of the Knights of St. John. The celebrated Colossus of Rhodes stood for fifty-six years, and was prostrated

by an earthquake 224 B.C. Pop. about 11,000.

RHODES, Cecil, born in England in 1853, went out to South Africa early in life, and becoming connected with the Kimberley diamond mines accumulated a large fortune. Having entered the Cape parliament, he became colonial prime-minister in 1890, and held this position till 1896, when his alleged connection with the Jameson raid caused him to resign. He was the leading spirit in the British South Africa company, and it was mainly by his influence that Rhodesia became British. He was made a privy councillor in 1895. He died in 1902.

RHODES SCHOLARSHIPS, The, under the will of Cecil John Rhodes, who died in 1902, a large part of his estate was bequeathed in trust for the purpose of maintaining a number of British, American, and German students at Oxford university, in the belief that "a good understanding between England, Germany, and the United States will secure the peace of the world, and that educational relations form the strongest tie." The founder suggested the following basis for awarding these scholarships: (1) Proficiency in literary and scholastic attainments, which was to count three-tenths; (2) success in outdoor sports, two-tenths; (3) qualities of manhood, etc., three-tenths; (4) qualities of leadership, two-tenths. Qualifications second and third were to be decided upon by a vote of the fellow students, first and fourth by the masters of the respective schools where candidates prepare. The number of scholarships to be thus distributed are as follows: Rhodesia, 9; Cape Colony, 12; Natal, 3; Australia, 18; New Zealand, 3; Canada, 6; Newfoundland, 3; Bermuda, 3; Jamaica, 3; two to each state and territory of the United States and 15 to Germany. The annual value of the colonial and American scholarships is \$1,500, tenable for three years. Only one-third of the colonial and one-half of the American scholarships are to be filled each year. The disposal of the German scholarships is at the pleasure of the emperor. Candidates must be from 20 to 25 years of age and must have attended two years at a recognized institution of higher learning. Scholars must be unmarried and citizens of the United States.

RHODESIA, a vast British territory in South Africa, stretching northward from the Transvaal across the Zambesi to the Congo Free State, and comprising Mashonaland, Matabeleland, etc. Southern Rhodesia is being rapidly developed. Chief towns, Bulawayo and Salisbury.

RHO'DIUM, a metal belonging to the platinum group, discovered by Wollaston in 1804. It is of grayish-white color very ductile and malleable, hard and very infusible, unaltered in the air at ordinary temperatures, but oxidizes at a red heat. It has been used for the points of metallic pens.

RHODODENDRON, a genus of evergreen shrubs with alternate, entire leaves, and ornamental flowers disposed in corymbs, belonging to a sub-order of the heaths and chiefly inhabiting the mountainous regions in Europe, North

and South America, and Asia. The varieties are very numerous, and are much cultivated in gardens. The colors



Rhododendron.

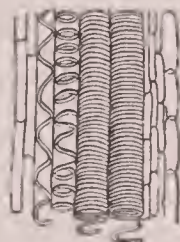
of the flowers range through rose, pink, lilac, scarlet, purple, red, and white.

RHONDDA, an urban district in Glamorganshire, South Wales, in the valley of a river of same name, which also gives name to a parl. div. Pop. of urban dist., 113,735; of div. 88,968.

RHONE (rôn), a river which rises in Switzerland, in the east of canton Valais, taking its origin in the Rhone Glacier, 5581 feet above the sea-level. It passes through the Lake of Geneva, and enters France, flowing first southward and then westward to the city of Lyons, where it turns almost due south, and so continues till it falls into the Gulf of Lyons. Its principal affluent is the Saône, which enters it at the city of Lyons; other large tributaries are the Isère and Durance. Its whole course is about 500 miles; its drainage area is 38,000 miles; and it is navigable for 360 miles.

RHONE, a department in France, in the basin of the Rhône, to which it sends its waters by the Saône (with the Azergues) and the Gier; area, 1077 sq. miles. The city of Lyons is the capital. Pop. 806,737.

RHUBARB, a genus of plants belonging to the natural order Polygonaceæ. The species of this genus are large-leaved herbaceous plants, natives of a



Spiral vessels of rhubarb, with cell tissue on each side—highly magnified.

considerable portion of Central Asia, with strong branching, almost fleshy roots and erect branching stems 6 to 8 feet high. They usually possess more or less purgative and astringent properties; this is essentially the case with

their roots, and hence these are largely used in medicine. The principal kinds of medicinal rhubarb have received such names as Russian or Turkey, East Indian, Himalayan, Chinese, and English, according to their source or the route by which they have reached Europe. At present most of the Asiatic rhubarb comes from China. American rhubarb has long been cultivated for medical purposes. The leaf-stalks of this species and others are now largely used for tarts, puddings, jam, etc., and the juice is made into a kind of wine.

RHYME, more correctly Rime (A. Saxon, rîm, number), in poetry, a correspondence in sound of the terminating word or syllable of one line of poetry with the terminating word or syllable of another.

RHYTHM, in general, means a measured succession of divisions or intervals in written composition, music, or dancing. The rhythm of poetry is the regular succession of accent, emphasis, or voice-stress; or a certain succession of long and short (heavy and light) syllables in a verse. Prose also has its rhythm, and the only difference (so far as sound is concerned) between verse and prose is, that the former consists of a regular succession of similar cadences, or of a



Medicinal rhubarb.

limited variety of cadences, divided by grammatical pauses and emphases into proportional clauses, so as to present sensible responses to the ear at regular proportioned distances. In music, rhythm is the disposition of the notes of a composition in respect of time and measure; the measured beat which marks the character and expression of the music.

RIAZAN, or **RYAZAN** (ryá-zán'), a government of Central Russia. The government has an area of 16,254 sq. miles, and is wholly drained by the Oka and its tributaries. The surface on the right of the Oka is largely swampy and has extensive forests; on the left it is generally fertile. Cereals of all kinds are produced for export. The principal manufactures are cotton, linen, leather, and spirits. Pop. 1,783,958.

RIB, the name given to the curved bones which in man and the other vertebrates spring from either side of the spine or vertebral column, and which

may or may not be joined to a sternum or breast-bone in front. The ribs ordinarily agree in number with the vertebrae of the back or dorsal region. Thus in man twelve dorsal vertebrae and twelve pairs of ribs exist. The true or sternal ribs are the first seven, which are articulated at one extremity to the spine, and at the other to the sternum by means of cartilages. The false or short ribs are the remaining five; the uppermost three being united by their cartilages to the cartilage of the last true rib. The others are free at their sternal extremity, and hence have been called "floating ribs." Ribs are wanting in such lower fishes as lampreys, lancelets, etc., and in amphibians such as frogs and toads. The number of these bones may be very great in certain species, and they are occasionally developed in the cervical and pelvic regions in reptiles and birds respectively.

RIBBON-FISHES, the name of certain deep-sea fishes met with in all parts of the ocean, generally found floating dead on the surface, or thrown ashore by the waves. The body is like a band from 15 to 20 feet long, 10 to 12 inches broad, and an inch or two thick. These fishes are generally silvery in color. They live at such a depth that when they reach the surface the expansion of gases in the body so loosens all parts of the muscular and bony system that some portions are nearly always broken on lifting them out of the water. The fin rays in young ribbon-fishes are extraordinarily developed, some of them being several times longer than the body.

RICAR'DO, David, a celebrated writer on finance and political economy, was born in London, in 1772, died 1823. In 1793 he embraced Christianity and married a Christian wife. He then began business as a stockbroker on his own account, and in a short time realized an immense fortune. His first publication was on the subject of the depreciation of the national currency (1810). He then published an Essay on Rent, and his name is usually associated with a certain distinctive view on this subject. But his most important work is his Treatise on Political Economy and Taxation, which appeared in 1817. In 1819 he entered parliament as member for Portarlington. In 1822 he published a pamphlet on Protection to Agriculture. Though his mode of treatment is totally different, he belongs essentially to the school of Adam Smith.

RICCIO. See Rizzio.

RICE, a cereal plant, natural order Gramineæ or Grasses. This important food-plant was long known in the East before it was introduced into Egypt and Greece. It is now cultivated extensively in the low grounds of the tropical and sub-tropical parts of south-eastern Asia, Egypt, Japan, part of the United States, and in several districts of southern Europe. The culm of the rice is from 1 to 6 feet high, annual, erect, simple, round, and jointed; the leaves are large, firm, and pointed, arising from very long, cylindrical, and finely striated sheaths; the flowers are disposed in a panicle somewhat resembling that of the oat; the seeds are white and oblong,

but vary in size and form in the numerous varieties. In the cultivation of this plant a high summer temperature is required, combined with abundance of water. Thus the sea-board areas and river deltas which are subject to inundation give the best conditions, otherwise irrigation is necessary. The amount of water required by the plant depends upon its strength and stage of growth. In Egypt it is sown while the waters of the Nile cover the land, and the rice plant grows luxuriant in the rich alluvial deposit left by the receding flood. The Chinese obtain two crops a year from the same ground, and cultivate it annually on the same soil, and without any other manure than the mud deposited by the water of the river used in overflowing it. The young plants are transplanted into ploughed furrows, and water is brought over them and kept on until the plants begin to ripen. The first crop is cut in May, and a second is immediately prepared for by burning the stubble, and this second crop ripens in October or November. In India two harvests are obtained in the year, especially in Bengal, and frequently two



Rice.

crops are taken from the same field. In Japan, Ceylon, and Java rice is cultivated much in the same manner. Mountain rice is a hardy variety which thrives on dry soil; and in India it is cultivated at an altitude of 8000 feet. Rice can be profitably cultivated only in warm countries, but has for some time past been grown in South Germany and Italy. In the United States it is grown chiefly in the swampy districts of South Carolina, Georgia, and Louisiana. In the husk rice is known by the name of "paddy." Rice is more largely consumed by the inhabitants of the world than any other grain; but it contains less flesh-forming matter (nitrogenous), this essential element being, in 100 parts of rice, only 6.5. At one period Europe was supplied from America, but this source has almost been entirely superseded by Lower Burmah, India, Siam, Japan, and Cochin-China. The inhabitants of the East obtain from rice a vinous liquor more intoxicating than wine; and arrack is also made from it. See Arrack.

RICE-BUNTING, a name given to two distinct birds. The first, also known by the name "bob-o'-link," a bird of the bunting family, which migrates over North America from Labrador to Mexico, appearing in Massachusetts about the beginning of May. Their food is insects, worms, and seeds, including rice in South Carolina. The song of the

male is singular and pleasant. When fat their flesh becomes little inferior in flavor to that of the European ortolan. The other species, known as the rice-bunting, also known as the Java sparrow and



Rice-bunting.

paddy bird. It belongs to the true finches, a group nearly allied to the buntings. It possesses a largely-developed bill; the head and tail are black, the belly rosy, the cheeks of the male white, and the legs flesh-colored. It is dreaded in Southern Asia on account of the ravages it commits in the rice-fields.

RICE-PAPER, a substance prepared from thin, uniform slices of the snow-white pith of a plant which grows in Formosa. Rice-paper is prepared in China, and is used in the manufacture of artificial flowers and by native artists for water-color drawings.

RICHARD I., King of England, surnamed Cœur de Lion, second son of Henry II. by Eleanor of Aquitaine, was born at Oxford in 1157. He several times rebelled against his father, and in 1189, supported by the King of France, he defeated the forces of Henry, who was compelled to acknowledge Richard as his heir. On Henry's death at Chinon, Richard sailed to England and was crowned at Westminster (September, 1189). The principal events of his reign are connected with the third crusade, in which he took part uniting his forces with those of Philip of France. In the course of this crusade he married the Princess Berengaria of Navarre in Cyprus. Richard left Palestine in 1192 and sailed for the Adriatic, but was wrecked near Aquileia. On his way home through Germany he was seized by the Duke of Austria, whom he had offended in Palestine, and was given up a prisoner to the Emperor Henry VI. During his captivity his brother John headed an insurrection in England in concert with the King of France, but Richard, who was ransomed, returned to England in 1194, and the movement came to nothing. Richard then passed over to Normandy, and spent the rest of his life there in warfare of no decisive character. He died in April, 1199, of a wound received while besieging the castle of Chalus. Richard was thoroughly neglectful of his duties as a king, and owes his fame chiefly to his personal bravery.

RICHARD II., King of England, son of Edward the Black Prince, and grandson of Edward III., was born at Bordeaux in 1366. He succeeded the latter in 1377. He is supposed to have been murdered in 1400.

RICHARD III., King of England, the last of the Plantagenet kings, born at Fotheringhay castle in 1450, was the youngest son of Richard, duke of York,

who was killed at Wakefield. On the accession of his brother Edward IV. he was created Duke of Gloucester, and during the early part of Edward's reign served him with great courage and fidelity. He married in 1473 Anne Neville, joint-heiress of the Earl of Warwick, whose other daughter was united to the Duke of Clarence, and quarrels rose between the two brothers over their wives' inheritance. On the death of Edward in 1483, the Duke of Gloucester was appointed protector of the kingdom; and he immediately caused his nephew, the young Edward V., to be declared king, and took an oath of fealty to him. But Richard soon began to pursue his own ambitious schemes. Earl Rivers, the queen's brother, and Sir R. Grey, a son by her first husband, were arrested and beheaded at Pomfret, and Lord Hastings, who adhered to his young sovereign, was executed without trial in the Tower. It was now asserted that the king and his brother were illegitimate, and that Richard had a legal title to the crown. The Duke of Buckingham supported Richard, and a body of peers and citizens having offered him the crown in the name of the nation he accepted it, and on July 8, 1483, was crowned at Westminster. The deposed king and his brother were, according to general belief, smothered in the Tower of London by order of their uncle. Richard governed with vigor and ability, but was not generally popular, and in 1485 Henry, earl of Richmond, head of the house of Lancaster, landed with a small army at Milford Haven. Richard met him on August 23d with an army of 15,000 men at Bosworth, in Leicestershire. Richmond had only 6000 men, but relied on the secret assurances of aid from Stanley, who commanded a separate royal force of 7000. In the midst of the battle, Stanley, by falling on the flank of the royal army, secured the victory to Richmond. Richard during the battle was slain; he possessed courage as well as capacity; but his conduct showed cruelty, dissimulation, treachery, and ambition. He has been represented as of small stature, deformed, and of a forbidding aspect; but his personal defects have probably been magnified.

RICHARD, Earl of Cornwall and Emperor of Germany between 1256 and 1272, during the so-called interregnum, a son of King John of England, was born in 1209. In 1268 he again visited Germany and held a diet at Worms in the following year. He died in England 2d April, 1272.

RICHARDSON, Charles, LL.D., born in 1775, died 1865. In 1818 he undertook the lexicographical articles in the *Encyclopædia Metropolitana*, and afterward published his great work, a *New Dictionary of the English Language* (2 vols. 1835-37). He also wrote a work on the *Study of Languages* (1854), and contributed frequently to the *Gentleman's* and other magazines.

RICHARDSON, Sir John, naturalist and arctic traveler, born at Dumfries 1787, died near Grasmere 1865. After studying medicine at the University of Edinburgh he entered the royal navy, in 1807, as assistant-surgeon. He served

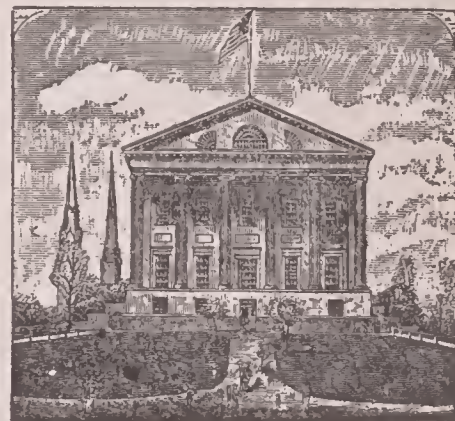
on various stations till 1819, and was surgeon and naturalist to the arctic expeditions of 1819-22 and 1825-27, under Sir John Franklin, exploring on the latter occasion the shores of the Arctic ocean between the Mackenzie and Coppermine rivers. In March, 1848, he took charge of an expedition to search for Franklin, and on his return published *The Arctic Searching Expedition* (1851) and *The Polar Regions* (1861).

RICHARDSON, Samuel, English novelist, was born in 1689 in Derbyshire, and received only a common school education. In 1741 his *Pamela, or Virtue Rewarded*, was published and its popularity was so great that it ran through five editions in one year. In 1749 the appearance of *Clarissa Harlowe*, fully established his literary reputation. The *History of Sir Charles Grandison* appeared in 1753, and was also received with great applause. He died in 1761, and was buried in the church of St. Bride, in Fleet street.

RICHELIEU (resh-lyeu), Armand Jean du Plessis, Cardinal, Duc de, French statesman, born at Paris 9th September, 1585; died there 4th of December, 1642. In 1614 as deputy of the clergy of Poitou to the states-general he managed to insinuate himself into the favor of the queen-mother, Marie de Medici, who obtained for him the post of grand-almoner, and in 1616 that of secretary of state for war and foreign affairs. He obtained, through the influence of the queen-mother, the cardinal's hat, and in 1624 was admitted into the council of state. From this date he was at the head of affairs, and he at once began systematically to extend the power of the crown by crushing the Huguenots, and overthrowing the privileges of the great vassals; and to increase the influence of the French monarchy by undermining that of the Hapsburgs, both beyond the Pyrenees and in Germany. The rallying point of the Huguenots was Rochelle; and Richelieu laid siege to that city, commanding the army in person. Rochelle, supported by supplies from England, held out for some time, but was compelled to surrender by famine (October 29, 1628). After the suppression of the Huguenots his next step was the removal of the queen-mother from court, she having endeavored to effect his fall. This he accomplished in November, 1630. In 1631 Richelieu was raised to the rank of duke. In 1632 a rising in favor of the Duke of Orleans, the king's brother, was suppressed by the royal forces directed by Richelieu, and the Duke of Montmorency was executed. The whole period of his government was marked by a series of conspiracies of the feudal nobility, the queen-mother, the queen herself, and even Louis, against the royal power exercised by Richelieu. But he was prepared at every point and his vengeance sure. During the Thirty Years' war the cardinal employed all the arts of negotiation and even force of arms to protect the Protestants of Germany, for the purpose of humbling the power of Austria. For the same object he declared war against Spain in 1635, and the separation of Portugal from Spain was effected by his assist-

ance (1640). He also endeavored to weaken Austrian influence in Italy, and procured the transfer of the duchy of Mantua to the Duke of Nevers. Among the last to be crushed by him were Cinq-Mars and De Thou, who, with the king's approval, attempted to ruin the great minister. Before his death he recommended Cardinal Magarin as his successor. Richelieu was a great statesman, but he was proud, arrogant, and vindictive. He was a patron of letters and art, and founder of the French academy and the *Jardin des Plantes*. He was the author of *Mémoires* relating to the years 1624-38; *Histoire de la Mère et du Fils*, etc.

RICHMOND, the capital of Virginia, is finely situated on the north side of James river, at the head of tide-water, 100 miles.w. of Washington. The streets are generally wide and well-built, and mostly intersect each other at right angles. There are many fine buildings, including the capital, governor's house, city hall, federal buildings, buildings of Richmond college, churches, schools, asylums, etc. The state house or capitol contains Houdon's celebrated marble statue of Washington, and in the capitol grounds are Foley's bronze statue of General T. J. ("Stonewall") Jackson and Crawford's bronze statue of Washington, 25 feet high, on a pedestal 42



State capitol, Richmond.

feet high, surrounded by other bronze statues. Water-power is almost unlimited, and the various mills and factories give employment to numerous workmen. The trade staples are tobacco, iron, grain, and flour. The first occupation of any part of its site was by English settlers in 1609; the city was formally founded in 1742, and became the seat of government in 1780. During the civil war it was the seat of the confederate government. It was invested by the federal armies, and surrendered on April 3, 1865. Pop. 114,000.

RICHMOND, a city in Indiana, on the east fork of the Whitewater, and at the junction of several important lines of railway (which connect it with Chicago, St. Louis, Cincinnati, etc.), 69 miles east of Indianapolis. Pop. 21,201.

RICHTER, Gustav, German painter, born at Berlin 1823, died there 1884. He was a member of the Academies of Berlin, Munich, and Vienna; executed frescoes in the Berlin Museum, and attracted attention by his *Raising of*

Jairus' Daughter and his Building of the Pyramids, a colossal picture (at Munich). It is on his portraits, however, that his fame chiefly rests, his sitters having included many European celebrities.

RICHTER, Jean Paul Friedrich, commonly called Jean Paul, German writer, was born March 21, 1763, at Wunsiedel, in the Fichtelgebirge, and died November 14, 1825, at Baireuth. In 1787-94 he had published his *Greenland Lawsuits*, (1783-84), *Selection from the Devil's Papers* (1789), *The Invisible Lodge* (1793). This brought him fame and money, and was followed by another romance, *Hesperus* (1795), and *The Life of Quintus Fixlein* (1796), a humorous idyl, works which made his name one of the best known in Germany. In 1798 he went to Weimar, and subsequently moved to other towns, finally settling at Baireuth in 1804.

RICHTS, a disease peculiar to infancy, chiefly characterized by changes in the texture, chemical composition, and outward form of the bony skeleton, and by altered functions of the other organs, transient for the most part, but occasionally permanent. The chief external features are the legs bent outward, chest unduly projecting, head large and forehead projecting, spine often curved, joints large and prominent, general form stunted, etc. Rickets is chiefly a disease of large cities, and its development is favored by want of nourishing food, overcrowding, and neglect of sanitary and hygienic precautions generally. In the treatment of rickets all means are employed by which the system is invigorated, including good food, fresh air, and exercise. The use of splints for the legs is often beneficial, and as the child grows up nature often remedies the worst features.

RICOCLET FIRING, the firing of guns, mortars, or howitzers with small charges and low elevation, so as to cause the balls or shells to bound along. It is very destructive, and is frequently used in sieges to clear the face of a ravelin, bastion, or other work, dismounting guns and scattering men; and may also be used against troops in the field.

RID'PATH, John Clark, American historian and educator, was born in Putnam co., Ind., in 1840. His writings, chiefly popularizations of historical matter, are his *Academic History of the United States*, *Popular History of the United States*, *Cyclopædia of Universal History*, *The Great Races of Mankind*. He compiled a *Library of Universal History*, and helped to edit the *People's Cyclopædia*. His most widely circulated work is *Ridpath's History of the United States*. He died in 1900.

RIEN'ZI, Cola di, a native of Rome, born about 1312. He was the son of a tavernkeeper, acquired a good education, and early distinguished himself by his talents, and especially by his attacks on the tyranny of the nobles. In 1342 he endeavored to induce Pope Clement VI., then at Avignon, to initiate reforms, but nothing was done. In 1347, during the absence of the governor of Rome, Stefano Colonna, Rienzi summoned a secret assembly of his friends upon Mount Aventine, and induced them all

to subscribe an oath for the establishment of a plan of government which he called the good estate. The people conferred upon him the title of tribune, with all the attributes of sovereignty. He banished several noble families, and compelled Colonna to quit Rome. His strict regard to justice and the public good in the first exercise of his power induced even the pope to countenance him. But he subsequently became ambitious and haughty, and finding he had lost the confidence of the people he withdrew from Rome in 1348. He returned secretly to Rome in 1350, but was discovered, and fell into the hands of Pope Clement at Avignon, who imprisoned him for three years. Innocent VI. released Rienzi, and sent him to Rome to oppose another popular demagogue named Boroncelli. But after a turbulent administration of a few months he was killed in 1354.

RIEL (re-él'), Louis, leader of the so-called "Riel's Rebellion" in Canada, was born at Saint Boniface, Manitoba, in 1844. He came into prominence as the leader of the rebellion of 1869. Colonel Wolseley (afterward Sir Garnet Wolseley, commander-in-chief of the British army) was dispatched with a force of about 1400 men. Finding resistance hopeless, Riel and some of his associates fled to the United States. Later he went to Montana. In 1884 he was invited by French half-breeds living near the forks of the Saskatchewan to come and assist them in forcing the government to settle their claims to certain land grants and to give them certain other rights. Riel accepted and was made president of the provisional government. Troops, however, were dispatched against the rebels, and the main stronghold of Batoche was taken by General Middleton. Riel himself was soon afterward captured, and in July was brought to trial at Regina for high treason, condemned, and on November 16, 1885, was hanged.

RIFLE, a portable firearm, the interior surface of the barrel of which is grooved, the channels being cut in the form of a screw. The number of these spiral channels or threads, as well as their depth, varies in different rifles, a highly approved form being with the channels and ridges of equal breadth, and the spiral turning more quickly as it nears the muzzle. The bullet fired is now always of an elongated form. The great advantage gained by a weapon of this construction is that the bullet discharged from the piece, by having a rotatory action imparted to its axis coincident with its line of flight, is preserved in its direct path without being subject to the aberrations that injure precision of aim in firing with unrifled arms. As a necessary consequence of the projectile being carried more directly in its line of aim, its length of range, as well as its certainty in hitting the object, is materially increased. Rifles were invented in Germany in 1498, and have been used as military weapons since 1631, but were not used in the British army until the latter half of the 18th century. Till 1851 the British infantry, with the exception of those regiments known as rifle corps, was universally

armed with the smooth-bore musket. In 1851 the first rifle firing an elongated bullet came in under the name of the Minié. Some of the regiments in the Crimean war were armed with this rifle, but it was cumbersome and heavy. It was succeeded in 1853 by the Enfield rifle. The chief feature of this rifle was the reduction of the bore to .577 in. in diameter, which made it considerably lighter. Britain was longer in adopting the breech-loading system than some other countries. Up to 1866 all British rifles had been muzzle-loaders, but in that year the Snider system of converting muzzle-loading arms into breech-loaders was adopted, and the army temporarily supplied with Enfield rifles converted into Sniders. Trials on a very extensive scale followed, resulting in the acceptance in 1871 of the Martini-Henry rifle, which became the rifle of the British army from 1874 onward. In this excellent weapon the breech is closed by a block which contains a piston or striker, the latter exploding the cartridge by the force of a strong spiral spring passing round it. An improved form of this arm was subsequently produced, viz. the Enfield-Martini, in which the barrel had a smaller bore, the diameter being reduced from .45 inch to .40. It was then determined by the authorities to adopt a repeating or magazine rifle, and in 1887 the Lee-Netford rifle was approved of. The rifling (Metford system) is in seven grooves without corners or angles, one turn or twist in 10 inches, calibre .303. The German needle-gun and the French Chassepot were the first of the breech-loading rifles to acquire a reputation for their use in actual warfare. Both these rifles have long been superseded, first by single-firing and then by repeating or magazine rifles. Germany having adopted the Mauser rifle and France the Lebel.

The repeating rifle is a development of a very old type of weapon. In the Spencer, the first used with signal success, the cartridges were in the stock of the arm; in the Winchester, one of the best known of repeating rifles, they are in a tube underneath the barrel. Some modern military magazine rifles draw their supply of cartridges from a reserve contained in a detachable magazine, the advantage being the greater efficiency of the weapon as a single-loader. The magazine of the Lebel rifle is in the fore end of the stock. The breech mechanism usually preferred is that upon the "door-bolt" principle, of which the Chassepot and Prussian needle-gun were well-known types; the Winchester is one of the few actuated by an under lever. In the Mannlicher, the weapon adopted by Austria, the bolt is drawn back simply; in others it has to be turned to the left before it can be withdrawn. With the Lebel the breech-bolt has two projections, which, when the bolt is turned, securely lock the bolt close to the base of the cartridge; in the Lee-Netford, a similar double-locking arrangement is placed where the projecting knob to actuate the mechanism joins the breech-bolt. The magazine of the Lee-Netford, containing eight cartridges, is placed under the stock behind

the barrel, to the level of which a spiral spring in the magazine raises the cartridges. The breech-bolt, which contains the firing mechanism and extractor, when pushed forward forces the raised cartridge into the barrel. The magazine is detached by pressing a "catch," or blocked by a "cut-off," when the rifle may be used as a single-loader.

When Whitworth produced his hexagonal bore rifle of .450 caliber, it was thought that the bullet was of insufficient diameter, and the .577 was adopted in its stead; later, after twenty years' experience with the .450 Martini-Henry, the bore has been still further reduced, chiefly owing to the discoveries of Hebler, whose Swiss rifle of $7\frac{1}{2}$ millimetres was found to give increased velocity, greater range, equal accuracy, and at the same time permitted of lighter ammunition being used. The bullet is coated with thin steel, ferro-nickel, or other hard metal, so that it shall not strip in the rifling, which has a sharp twist, one complete turn in less than 12 inches, and leaves the muzzle at a velocity of 2000 or more feet per second, thus giving an extreme range of 3500 yards. Improved explosives, almost smokeless and which do not foul the barrel, have added to the success of the small-bore rifle.

Sporting rifles have a shorter range and inferior velocity to the best military weapons, their object being not extreme range or penetration, but great force at impact to produce such a shock as will paralyze the game shot.

RIGA, a seaport of Russia, capital of the government of Livonia, on both sides of the Duna or Dwina, about 5 miles above its mouth in the Gulf of Riga. Pop. 282,943, of whom nearly half are Germans, and Protestants by religion.

RIGHTS, BILL OF, on February 13, 1688-89, the declaration of right was delivered by the lords and commons to the prince and princess of Orange. In October, 1689, the rights claimed by the declaration were enacted with some alterations by the bill of rights, next to Magna Charta the greatest landmark in the constitutional history of England and the nearest approach to the written constitutions of other countries.

The declaration of right and the bill of rights introduced no new principle into the English constitution. In the United States, the main provisions of the bill of rights, so far as they are applicable, have been adopted both in the constitution of the United States and in the state constitutions. See Bill, Rights of.

RIGHTS OF MAN, a theoretical declaration passed by the French National assembly in August, 1789. It was attacked by Edmund Burke in his *Reflections on the French Revolution*. Thomas Paine replied to Burke in his *Rights of Man*. See Paine, Thomas.

RIGOR MORTIS, the rigidity of limbs that follows death. It is one of the signs of cessation of life.

RIG-VEDA, the first and principal of the Vedas or sacred hymns of the Hindus. See Vedas.

RILEY, Charles Valentine, entomologist, was born at London, England, in

1843, came to America in 1860, and located in Chicago. He served during the civil war as a member of the 134th Illinois infantry. In 1877 he was appointed chief of the entomological commission of the United States, and entomologist of the agricultural department in 1878. He organized the entomological branch of that department in 1881, also having the custody of the insect department of the National museum, which now contains over 100,000 specimens given it by Professor Riley. He was a member of the leading scientific organizations in this country and in Europe. He has been a voluminous writer on entomology, and is the author of works dealing with the various phases of that science. He died in 1895.

RILEY, James Whitcomb, American poet, was born in 1853. His first book of verse appeared in 1883, entitled, *The Old Swimmer-hole and 'Leven More Poems*. Among his other works are: *Character Sketches and Poems*, *Afterwhiles*, *Pipes o' Pan: at Zekesbury*, *Rhymes of Childhood*, *An Old Sweetheart of Mine*, *Green Fields and Running Brooks*, *Poems Here at Home*, *Armazindy*, *Home Folks*, *Book of Joyous Children*.

RINDERPEST (German name), or Cattle-plague, a contagious disease which attacks animals of the ox family, and is attended with the most deadly results. The disease appears to be identical with what was formerly known as murrain, and is sometimes called the steppe-murrain, from the Russian steppes, which are its habitat. This disease has caused great havoc among cattle for at least a thousand years, spreading occasionally like a pestilence over Europe. The probable cause of the disease is a micro-organism which is found in the blood and all the discharges of the infected animals, and is capable of being transmitted indirectly by any of these to great distances. Sheep and other animals can be affected by the disease, but in a less intense form. The period of incubation varies from two to ten days. The symptoms are elevation of the temperature of the body, followed by a heightened color of the mucous membrane of the mouth, and granular yellowish eruptions on the gums, lips, tongue, palate, and cheeks. The skin becomes congested, and develops scales with papular eruptions, and finally a slimy discharge comes from the eyes and nose. The name is also given to an eminently fatal cattle disease of America differing, however, from the true rinderpest in attacking cows only, and in running its course in three days in place of seven, the general duration of the European form of the disease.

RINEHART, William Henry, an American sculptor, born near Union Bridge, Carroll co., Md., in 1825. He executed the two statuettes, an "Indian" and a "Backwoodsman," which act as supports for the clock in the house of representatives. He returned to Italy in 1858, settling at Rome, where he died. In 1872 his marble statue of Chief Justice Taney was erected at Annapolis; His works are in the Corcoran Art gallery, Washington, and in the Peabody institute, Baltimore. The former

possesses his "Atalanta," "Latona and Her Children," "Diana," "Apollo," "Endymion," and "Rebecca;" in the latter are the works left in the sculptor's studio at his death, and his "Clytie Forsaken by Apollo," which is considered his masterpiece. He died in 1874.

RING, an ornament for the fingers which has been worn from the most ancient period of civilization. Among the ancient nations who are known to have attached special importance to the wearing of rings were the Assyrians, Egyptians, Hebrews, Greeks, and Romans. The nose, ears, arms, and even the legs and toes have also, among various people, been decorated with them. Rings have also from a very early period been reckoned as symbols of authority, which could be delegated by merely delivering the ring to an agent; they were also used as symbols of subjection. The earliest mention of rings is in the book of Genesis, and relates to the Hebrews. Among the Egyptians rings of gold were worn in great profusion. The common people wore porcelain rings. The Greeks and Romans used them for sealing contracts, closing coffers, etc. The modern use of wedding rings was probably derived from the Jews. A ring appears from an early period to have been one of the insignia of a bishop. Motto rings date from the time of the Romans, and were long popular in Britain.

RINGBONE, an exostosis or bony tumor mostly met with on the coronet of overworked horses, but sometimes seen on colts, or even newly-dropped foals. Ringbone injures a horse's market value, and is practically incurable.

RING-DOVE, or **CUSHAT**, the largest of the pigeons inhabiting Britain, a bird which occurs very generally throughout the wooded parts of Europe. It is migratory in countries in which the severe winters preclude the possibility of its obtaining a due supply of food, and even in Britain, in which it permanently resides, it appears on the approach of winter to assemble in flocks, and to perform a limited migration, probably in search of food. A bluish-gray color prevails generally over the head, cheeks, neck, back, and rump, while the breast and under parts of the neck are of a purplish red, the belly and thighs dull white. A patch of white on either side of the neck forms a sort of ring or collar. The average length is about 16 or 17 inches. The food of the ring-dove consists of grain, acorns, berries, the leaves and tops of turnips, etc. The nests are composed of sticks and twigs loosely placed together. The birds are wary and shy, and rarely breed in confinement.

RINGWORM, a chronic contagious disease of the hair, hair-bulbs, and epithelial covering of the skin. It is due to a microscopic fungus, which lays hold upon and preys upon these tissues, and is very contagious. It is known by the decolorization and brittleness of the affected hairs, by the scaly eruption, and roundness of the affected patches. Ringworm is most commonly found on the scalp. The treatment of the disease consists in destroying the vitality of the

fungus, which is effected by a solution of sulphurous acid or of corrosive sublimate.

RIO-DE-JANEIRO (rê-o-de-zhã-nã'i-ro), the capital of the republic of Brazil, second largest city of South America, is most beautifully and advantageously situated on the southeastern coast, on a fine natural harbor formed by a bay of the same name. The finest buildings are the opera-house, senate-house, military barracks, and the national museum,



while the churches are chiefly notable for their gaudy interior decorations. A striking feature in the city is the aqueduct, which brings the water a distance of 12 miles and here crosses a wide valley on a beautiful double-tier of granite arches. Among benevolent institutions are the Casa da Misericórdia, several other hospitals, and a large lunatic asylum. There are two colleges, medical schools, a naval and military academy, numerous scientific establish-

extends inward 15 miles, with a width varying from 2 to 8 miles. It is diversified with numerous islands, surrounded by hills covered by luxuriant tropical vegetation, and affords safe anchorage for the largest vessels. Manufactures are unimportant, but there is an extensive trade in coffee, sugar, hides, tobacco, timber, etc. The principal imports are linen, woolen, and cotton tissues; iron and steel goods, and provisions and preserved meats. The city is the central terminus of the railways of the country; pop. 522,621.

The state of Rio-de-Janeiro has an area of about 28,000 miles, and is decidedly mountainous in the center. It is the best-cultivated state in Brazil, the chief crop being coffee. Immense herds of cattle are reared, and the forests are rich in timber. Capital, Niterói. Pop. 876,884.

RIO-GRANDE-DEL-NORTE. See Bravo.

RIO-GRANDE-DO-SUL, the most southern state in Brazil, bounded partly by the Atlantic, and bordering with Uruguay and the Argentine Republic, has an area of 91,336 sq. miles, and a pop. of 897,455. It is well-watered, contains much fertile land, and has a healthy climate. On the coast is the large lake or lagoon of Patos, besides others. The chief occupations of the inhabitants are cattle-rearing and agriculture. Among the population are 100,000 Germans, there being a number of flourishing German settlements. There are some 600 miles of railway. Hides, tallow, horse-hair, bones, etc., are exported. The capital is Porto Alegre. The town of Rio-Grande is situated on a peninsula near where the Lake of Patos communicates with the Atlantic. Its houses are mostly of earth, and its streets unpaved. It has an active trade in hides, horse-hair, wool, tallow, etc. Pop. 18,000 or 19,000.

produced. Pop. 100,000. Chief town, La Rioja, at the foot of the Sierra Velasco, in the midst of vineyards and orange groves. Pop. 8000.

RIO NEGRO (Spanish "black river"), the name of numerous streams, of which two are important: (1) A river of South America, and principal tributary of the Amazon. It rises in Colombia and joins the Amazon after a course of about 1000 miles at Manaos, Brazil. Through its affluent, the Cassiquiare, there is direct communication between the Amazon and Orinoco. (2) A river of South America forming the boundary between the Argentine Republic and Patagonia. It rises in the Andes in Chile, and is about 700 miles long. Its current is very rapid, and its bed obstructed with shoals and sandbanks.

RIOT, a disturbance of the public peace, attended with circumstances of tumult and commotion, as where an assembly destroys, or in any manner damages, seizes, or invades private or public property, or does any injury whatever by actual or threatened violence to the persons of individuals. By the English common law a riot is an unlawful assembly of three or more persons which has actually begun to execute the common purpose for which it assembled by a breach of the peace, and to the terror of the public. A lawful assembly may become a riot if the persons assembled form and proceed to execute an unlawful purpose to the terror of the people, although they had not that purpose when they assembled. Every person convicted of riot is liable to be sentenced to hard labor. By act 1 George I. cap. v. s. 2, called the Riot Act, whenever twelve or more persons are unlawfully assembled to the disturbance of the peace, it is the duty of the justices of the peace, and the sheriff and under-sheriff of the county, or of the mayor or other head officers of a city or town corporate, to command them by proclamation to disperse. And all persons who continue unlawfully together for one hour after the proclamation was made, commit a felony, and are liable to penal servitude or imprisonment (substituted for death by 7 Will. 4 and 1 Vict.). The act also contains a clause indemnifying the officers and their assistants in case any of the mob should be killed or injured in the attempt to arrest or disperse them. Compensation out of the rates is paid to persons sustaining damage by riot. In the United States the definition of Riot and its punishment are regulated by statute but the English law practically covers the subject.

RIPLEY, George, an American author, born at Greenfield, Massachusetts, 1802; died 1880. He became literary editor of the New York Tribune in 1849, and was joint editor with C. A. Dana of the American Cyclopædia (1858-63, 16 vols., also of the second edition).

RIPPLE-MARKS, the wavy or ridgy marks left on the beach of a sea, lake, or river by the ripples or wavelets. Such marks have often been preserved when the sand has hardened into rock, and are held by geologists as indications that deposition of the beds in which they occur took place on the sea-shore or at a



View of Rio-de-Janeiro.

ments, public schools, national library, a botanical garden and observatory. At Rio is the chief military arsenal of the republic, while on one of the islands in the bay there is a naval arsenal with docks and building yards. The bay has its entrance, 1700 yards wide, between Fort St. Juan and Fort Santa Cruz, and

RIOJA (rê-ô'hâ), La, one of the western provinces of the Argentine Republic. It is well watered on the west, but in the east and south there are salt and sand deserts. The climate is dry and healthy. The inhabitants are chiefly engaged in agriculture and cattle-rearing. Excellent wheat, wine, and fruits are

depth not greater than 60 feet. We have also wind ripple-marks and current ripple-marks, and it requires much discrimination to determine the producing cause.

RISTO'RI, Adelaide, Italian actress, born 1822. She married the Marquis Capranica del Grillo in 1847, and afterward played in all the chief European capitals. She took her farewell of the English stage in Manchester, Nov. 8, 1873. Among her chief characters are Medea, Francesca da Rimini, Marie Antoinette, Mary Stuart, and Lady Macbeth. She visited the United States in 1866, 1875, and 1884-85. She died in 1906.

RITUALISM, a strict adherence to rites and ceremonies in public worship. The term is more especially applied to a tendency recently manifested in the Church of England, resulting in a series of changes introduced by various clergymen of the high church party into the services of the church. These changes may be described externally as generally in the direction of a more ornate worship, and as to their spirit or animating principle, as the infusion into outward forms of a larger measure of the symbolic element. They are defended on the grounds of law, ancient custom, inherent propriety, and divine sanction or authority. The points of ritual about which there has been the most violent contention are those which involve the adoration of Christ as present on the altar under the forms of bread and wine. Other points are: the eastward position of the priest at consecration; lights on the holy table; the use of various vestments; the use of incense; mixing water with wine for communion; fasting before communion from previous midnight; regular confession to a priest, with absolution and penance; etc.

RIVER-HORSE, a name sometimes given to the hippopotamus.

RIVERS rank high in importance among the natural features of the globe, and are intimately connected with the history and condition of mankind. They have always formed important highways of communication, and the great cities built upon their banks have constituted in all ages the seats of empire. Every circumstance concerning rivers is therefore of importance, as their source, length of channel, outlet, rapidity of current, depth, and consequent capability of navigation. The source of a river is either a spring or springs, or a lake, or the river takes its origin from the melting of the snow and ice on mountains. The termination of a river is usually in the sea, a lake, or another river, or it may lose itself in the sand. All the streams which ultimately gather into one river form a river system, and the region which is drained by such a system of streams is called a river basin. River basins are usually separated from each other by more or less elevated ground, and the line of greatest elevation between them is called a watershed. In speaking of the right and left bank of a river we are always supposed to have the position of a person looking in the direction toward its mouth. The volume of water which rivers contain varies with many conditions, dependent

upon the nature of the sources by which they are fed and the amount of rainfall throughout their course. The periodical melting of the snows adds greatly, in some cases, to the volume of rivers which have their origin in mountain regions, the rainy season in tropical regions has a similar effect (as in the case of the Nile), often causing extensive inundations. In arid countries the so-called rivers are often mere surface torrents, dependent on the rains, and exhibiting merely the dry beds of water-courses during the season of drought. The "creeks" of Australia and the "wadies" of the Arabian desert are of this character. The average fall of a river's bed is indicated by the difference between the altitudes of its source and its outlet compared with its length of channel. The fall of many great rivers is much less than might be supposed. The Amazon has a fall of only 12 inches in the last 700 miles of its course. The Volga, which rises at an elevation of 633 feet above the Caspian sea, has an average inclination of less than 4 inches to the mile throughout its course of more than 2000 miles. The Aberdeenshire river Dee, which rises at a height of 4060 feet, has a course of only 87 miles to its outlet, showing an average declivity of 46 feet per mile. Many rivers carry down immense quantities of earthy matter which accumulates at their mouths forming what is called a delta (which see). Among the great rivers of the world are the Mississippi and Missouri (4200 miles), and the Amazon (3900 miles), in America; the Yang-tse-Kiang, the Amoor, the Yenisei, the Indus, and Ganges in Asia, all over 1500 miles in length; the Congo (3000 miles), the Niger (2600 miles), and the Nile (4200 miles), in Africa; and the Danube (1670 miles), Volga (2200 miles), and the Rhine (800 miles), in Europe.

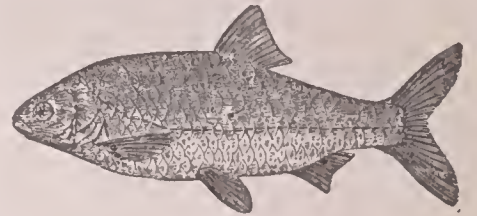
RIVER-TORTOISE, a name of a family of tortoises that are aquatic in their habits, coming to shore only to deposit their eggs. They are exclusively carnivorous, subsisting on fishes, reptiles, birds, etc. The edges of the mandible are so sharp and firm that they easily snap off a man's finger. They inhabit almost every river and lake in the warmer regions in the Old and New Worlds, and are particularly plentiful in the Ganges, where they prey on human bodies.

RIVET, a short metallic pin or bolt passing through a hole and keeping two pieces of metal together; especially, a short bolt or pin of wrought iron, copper, or of any other malleable material, formed with a head and inserted into a hole at the junction of two pieces of metal, the point after insertion being hammered broad so as to keep the pieces closely bound together. Rivets are especially employed in making boilers, tanks, iron bridges, etc. They are closed up by hammering when they are in a heated state, the hammering being either done by hand or by machinery.

RIVIERA (riv-i-ã'ra), the name given to a portion of the coast of North Italy, on each side of the town of Genoa. It extends to Spezzia on the east and Nice on the west, and is much resorted to by invalids.

RIZZIO, David, a native of Turin, came to Scotland in 1564 in the train of the ambassador from Savoy, and soon became so great a favorite with the queen that he was appointed her secretary for foreign languages. The distinction with which he was treated by his mistress soon excited the envy of the nobles and the jealousy of Darnley. A conspiracy, with the king at its head, was formed for his destruction, and before he had enjoyed two years of court favor, the Lord Ruthven and others of his party were introduced by Darnley into the queen's apartment, where they dispatched the object of their revenge, 9th March, 1566. Popular tradition assigns to Rizzio the improvement of the Scottish style of music, but many of the airs which have been ascribed to Rizzio are traced to more distant periods.

ROACH, a species of fresh-water fish of the carp family found in Britain and



The European roach.

other parts of Europe. Their average length is about 9 or 10 inches. Allied fishes receive the same name in America.

ROADS are artificial pathways formed through a country for the accommodation of travelers and the carriage of commodities. Though the Romans set an example as roadbuilders, some of their public highways being yet serviceable, the roads throughout most of Europe were in a wretched condition till toward the end of the 18th century. France was in advance of other countries in road-making; in England a decided improvement of the highways only began in the 19th century. When diversities of level are necessary, road-engineers fix the degree of inclination at the lowest possible point. Telford estimated the maximum inclination of a road to be 1 in 24, but except in extreme cases it is considered better that it should not exceed 1 in 50. The angle of repose, or maximum slope on which a carriage will stand, has been estimated at 1 in 40. The width of the road is also a very important consideration as bearing both on the original cost and on the permanent maintenance. A properly-constructed road, besides a foundation, consists of two layers, an upper and an under. After a good foundation is obtained the laying of a base, the best material being concrete of gravel and lime, gives durability to the road. Upon this base the actual roadway is laid with a slight inclination from the center to the sides for the purpose of drainage. Before the time of Macadam it was customary to use broken stones of different sizes to form the roadway, the consequence being that in course of time the smaller stones sank, making the road rough and dangerous. Macadam early in the 19th century introduced the principle of using stones of uniform size from top to bottom. What is known as the rule of

the rule is that in passing, whether going in the same or opposite direction, the rider or driver must pass on the right hand of the other rider or driver.

ROANOKE (ro-a-nōk'), a navigable river formed by the union of the Dan and the Staunton, which after a course of about 250 miles falls into Albemarle sound. It is tidal for 75 miles. —The town of Roanoke, Virginia, situated on this river, has become a flourishing industrial center. Pop. 25,160.

ROARING, in horses, is a disease of the nerves and muscles of the larynx which causes an obstruction to the passage of air, giving rise, when the horse is briskly exercised, to the peculiar sound from which the disease derives its name. The cause of the disease is in most cases attributed to fatty degeneration and atrophy of the laryngeal nerve, which brings about an atrophy of the muscles of the larynx on the side affected, and thus causes the arytenoid cartilage to obstruct the passage. The disease generally affects the left side, and is not, as a rule, amenable to treatment. Several cases have been cured lately by excision of a portion of the affected arytenoid cartilage, and this operation promises to be very successful in this disease.

ROASTING is the cooking of meat by the direct action of fire—that is, by dry heat, either before the fire or in an oven. Roasting before an open fire is considered preferable to roasting in an oven (which is analogous to baking), on account of the free ventilation to which it exposes the meat during the process. The apparatus in most kitchens for open roasting are a fire, a spit, a contrivance for turning the meat to present all sides of it alternately to the fire, a screen to economize the heat, and a saucepan to catch the dripping. The fire must be kept even and bright throughout. During the process of roasting, the meat should be basted with the dripping to keep it soft and allow the heat to penetrate. The speciality of roasting as compared with boiling is that it retains the saline ingredients of the meat. The time allowed for roasting is roughly estimated at a quarter of an hour to 1 lb. of meat. Longer time is required in winter than in summer, and for new than old killed meat.

ROBBERY, a felonious and forcible taking away another man's goods or money from his person, presence, or estate by violence or putting him in fear. Violence or intimidation is the criterion which distinguishes robbery from other larcenies; and it is sufficient that so much force or threatening, by word or gesture, is used as might create an apprehension of danger, so as to lead a man to part with his property against his will. Highway robbery, or the forcible taking of property from travelers, in many countries is a capital offense, and in all civilized countries is severely punished.

ROBERT, Duke of Normandy, surnamed the Devil, was the younger son of Duke Richard II. by his marriage with Judith, a daughter of Count Godfrey of Brittany. In 1027 he succeeded his elder brother, Richard III., whom he is charged with having poisoned. The first years of his government were employed in bringing his rebellious vassals

into subjection, and he then restored Count Baldwin of Flanders to his states, assisted Henry I., king of France, against his mother Constantia, and humbled Count Otho of Champagne. In 1034 his fleet was wrecked off Jersey while on its way to England to support his nephews Alfred and Edward against Canute, who had excluded them from the succession to the English throne. Hereupon he concluded a truce with Canute, by which the two princes were promised half of England. In 1033 he set out to visit the holy places, and subsequently made the pilgrimage to Jerusalem on foot. While returning he died suddenly at Nicæa in Asia Minor (1035), and is supposed to have been poisoned by his servants. His heroic deeds and penance have given rise to numerous stories. William the Conqueror was his son.

ROBERT II., King of Scotland, was the son of Marjory, daughter of Robert Bruce, and of Walter, steward of Scotland, and was thus the first of the Stewart or Stuart kings. He was born 1316, and was recognized by parliament in 1318 as heir to the crown. On the death of David II. he was crowned at Scone, 26th March, 1371. He had long acted as regent, and had done good service in the English wars. An act of parliament in 1375 settled the crown on his sons by his first wife Elizabeth Mure of Rowallan, illegitimate by ecclesiastical law. His reign was comparatively a peaceful one, one of the chief events being the battle of Otterburn. He died in 1390.

ROBERT III., King of Scotland, eldest son of the preceding, was born in 1340 and was originally called John, but changed his name on his coronation, in 1390. Robert died in 1406.

ROBERT OF GLOUCESTER, an English historian, is supposed to have been a monk in the abbey of Gloucester during the reign of Edward I., but of his private history nothing is known.

ROBERTS, Frederick Sleigh, Earl, V.C., son of Sir Abraham Roberts, was born in 1832. He entered the army and became a lieutenant in the Bengal artillery in 1851 and a captain in 1860. He gained the Victoria Cross in the Indian mutiny, and was made brevet-major. He took part in the Abyssinian war 1867-68, and in 1872 was made a C.B. for his services in India on the Lushai expedition. He commanded a column in the Afghan war of 1878, and after a brilliant march from Cabul to Candahar utterly defeated Ayoub Khan. In 1881 he was created a baronet and G.C.B. He became commander-in-chief in India in 1885, was made a baron in 1892, field-marshal and commander-in-chief in Ireland, 1895; commander-in-chief in the Boer war, 1900; commander-in-chief of the army, 1900; created earl and K.G., 1901. He is author of *Forty-one Years in India* (1897).

ROBESPIERRE (rob-es-pi-är), François Maximilien Joseph Isidore, was born at Arras in 1758, and was the son of an advocate. He was educated at the college of Louis-le-Grand at Paris. He afterward practiced as an advocate at Arras, and held for a short period the position of judge in the bishop's diocese. In 1789 he was elected deputy to the

states-general, and was a zealous supporter of democratic measures. At this time he became a prominent member of the Jacobins and other revolutionary clubs. In March, 1791, he was appointed public accuser to the New Courts of Judicature. He remained in the background during the September massacres of 1792, which he assisted in planning, leaving the work with Marat and Danton. In the same month he was elected a member of the convention, and in the proceedings against Louis XVI. distinguished himself by the relentless rancour with which he opposed every proposal to avert or delay the fatal result. On 19th March, 1794, the Hébertists fell victims to his jealousy. Eleven days later he caused Danton to be arrested, who, after a trial of three days, was guillotined, together with Camille Desmoulins, on April 5th. Robespierre's power now seemed to be completely established, and the Reign of Terror was



Maximilien Robespierre.

at its height. On June 8, 1794, he, as president of the convention, made the convention decree the existence of the Supreme Being; and on the same day he celebrated the Feast of the Supreme Being. In the meantime a party in the convention was formed against Robespierre and on July 27 he was openly accused of despotism. A decree of arrest was carried against him, and he was thrown into the Luxembourg prison. He was released by his keeper on the night of the same day, and conducted to the Hall of Commune, where his supporters were collected. On the following day Barras was sent with an armed force to effect his arrest. Robespierre's followers deserted him, and he was guillotined on July 27, 1794, together with some twenty-three of his supporters. The tendency with modern writers is to modify the character for infamy which at one time obtained regarding Robespierre.

ROBIN, a name given to several birds, more especially to the robin redbreast of Europe (see Redbreast) and to an American species of blackbird, as also to the bluebird of America.

ROBINSON, Rev. Edward, D.D., LL.D., biblical scholar and explorer of the Holy Land, born at Southington, Connecticut, 1794; died at New York 1863. In 1837 he made a voyage to the Holy Land. The result of this journey

was his great work entitled *Biblical Researches in Palestine, Mount Sinai, and Arabia Petræa* (1841, 3 vols.), subsequently enlarged after a second visit to Palestine in 1852. He had been appointed to the chair of biblical literature in Union Theological seminary, New York, but only entered on the duties in 1840, occupying the post till his death.

ROBINSON CRUSOE, a celebrated romance, written by the well-known Defoe, and published in 1719.

ROB ROY (that is, "Robert the Red") a celebrated Highland freebooter, whose true name was Robert Macgregor, but who assumed his mother's family name, Campbell, on account of the outlawry of the clan Macgregor by the Scotch parliament in 1662. He was born about 1660. He was the younger son of Donald Macgregor of Glengyle, by his wife, a daughter of Campbell of Glenfalloch. His own designation was of Inversnaid, but he seems to have acquired a right to the property of Craig Royston, on the east side of Loch Lomond. Like other Highland gentlemen, Rob Roy was a trader in cattle previous to the rebellion of 1715, in which he joined the adherents of the pretender. On the suppression of the rebellion the Duke of Montrose, with whom Rob Roy had previously had a quarrel, took the opportunity to deprive him of his estates; and the latter began to indemnify himself by a war of reprisals upon the property of the duke. An English garrison was stationed at Inversnaid, not far from Aberfoyle, the residence of Rob Roy; but his activity and courage saved him from the hands of his enemies, from whom he continued for some time to levy blackmail. In his latter years he became reconciled to Montrose, and died at Balquhider in 1734. See Sir Walter Scott's *Introduction to the novel of Rob Roy*.

ROBSON, Stuart, American comedian, was born at Annapolis, Md., in 1836, his real name being Robson Stuart. His *Captain Crosstree* in the burlesque of *Black-Eyed Susan* is one of his best characters. In 1877 he made a hit in *Our Boarding House* with W. H. Crane and the two established a partnership which lasted till 1889. They successfully revived several of Shakespeare's comedies. Among their greatest successes were *The Two Dromios* and *The Henrietta*. He died in 1903.

ROC, a fabulous bird of immense size and strength, which is mentioned in the *Arabian Nights* entertainments. A belief in it was spread in Europe during the middle ages, having been brought from the east probably as a consequence of the *Cruades*.

ROCHAMBEAU (ro-shān-bō), Jean Baptiste (Donatien de Vimeur, Count de, Marshal of France, born 1725, entered the French army in 1742, distinguished himself in the Seven Years' war, and became field-marshal in 1761. He died in 1807.

ROCHEFORT (rosh-fōr), Henri (Victor Henri, Marquis de Rochefort-Luçay), a French journalist, dramatist, and politician, born in Paris, 1832. After Sedan he became a member of the government of National defense. He fled from Paris in May, 1871, when he foresaw the end of the Commune, of which he had

been a vigorous supporter, but was arrested by the Versailles government and sentenced to transportation to New Caledonia. He escaped in 1874, and after the general amnesty of 1880 returned to Paris (July 12th), where he founded his new journal the *Intransigent*. He was returned as deputy by the department of the Seine, but resigned his seat in February, 1886. His influence suffered from his joining in the Boulangist movement.

ROCHELLE SALTS, the double tartrate of sodium and potassium, crystallizing in large rhombic prisms. It has a mild, hardly saline taste, and acts as a laxative.

ROCHESTER, capital of Monroe co., New York state, on both sides of the Genesee (over which are several bridges), 7 miles above its entrance into Lake Ontario, on the Erie canal, which here crosses the river by a splendid aqueduct. The town is well built, among buildings and institutions being a Roman Catholic cathedral, a court-house, and city-hall, a university, a Baptist theological seminary, a free library, an athenæum, etc. The prosperity of Rochester is partly due to the immense water-power furnished by the falls of the Genesee, which within the city limits makes a descent of 268 feet, one of the falls having a height of 96 feet. This power is employed in driving flour-mills, which are here on a great scale, and also in various other industrial establishments. The suburbs are highly cultivated, there being a great extent of nursery grounds. In 1812 two log-huts were the only buildings on the site now occupied by Rochester. Pop. 1909, estimated at 200,000.

ROCK, in geology, is a term applied to any considerable aggregation of mineral matter, whether hard and massive like granite, marble, etc., or friable and unconsolidated like clay, sand, and gravel. In popular language, however, it is confined to any large mass of stony matter as distinguished from soil, mud, sand, gravel, etc.

ROCKET, a projectile consisting of an iron cylinder filled with an inflammable composition, the reaction of the gases produced by the combustion of which, pressing on the head of the rocket, serve to propel it through the air. Rockets were first used in eastern countries. They were kept point first by the use of a stick which acted on the principle of an arrow's feathers. But the rocket now used has no stick, being kept point first by rapid rotation, imparted to it by means of three curved shields fixed on the base so as to be on the same side of each vent. They may be discharged from tubes or troughs, or even laid on the ground. In war rockets are chiefly used for incendiary purposes, for moral effect—especially frightening horses and for various irregular operations. Signal and sky rockets are small rockets formed of pasteboard cylinders, filled with combustible materials, which, when the rocket has attained its greatest height and bursts, cast a brilliant light which may be seen at a great distance.

ROCKEFELLER, John D., American capitalist, was born in Richford, Tioga Co., N. Y., in 1839. In 1851 when twelve years of age he was taken by

his parents to Cleveland, Ohio. In 1860 he engaged in the oil business, and in partnership with his brother William and others built in 1865 a large refinery known as the Standard Oil Refinery. In 1870 a number of firms were combined under the name of the Standard Oil Co., of which John D. was the president and controlling spirit. By degrees the Standard Oil Company absorbed or drove out of business most of its rivals. In 1882 the Standard Oil Trust was organized, but this was dissolved ten years later. Since that time the various companies have been operated separately, but all are under the management of Rockefeller and his associates, whose control of the oil business is complete. In 1892 he founded and endowed the University of Chicago. To this institution he has given nearly \$25,000,000. In 1907 the Standard Oil Co. was fined for violating the Interstate Commerce Law in receiving rebates from the Chicago & Alton Railway, \$39,000,000.

ROCKFORD, a city in Illinois, finely situated on the Rock river, 93 miles w.n.w. of Chicago. It has abundant water-power, woolen and cotton factories, iron-foundries, agricultural machine and implement factories, wagon and carriage factories, etc. Pop. 37,090.

ROCK ISLAND, a town in Illinois, on the Mississippi, at the foot of the Upper Rapids, deriving its name from an island in the river, on which there is now an extensive government arsenal. It is a great center of railway and river traffic, and is connected with Davenport on the opposite side of the river by a railway and general traffic bridge. Pop. 23,683.

ROCK RIVER, a river of the United States, which rises in Wisconsin, 50 miles west of Lake Michigan, and falls into the Mississippi 2 miles below Rock Island City. Length, 330 miles, about 225 of which have been ascended by small steam-boats.

ROCKY MOUNTAINS, a name indefinitely given to the whole of the extensive system of mountains which covers a great portion of the western half of North America, but more properly applied to the eastern border of this mountain region, commencing in New Mexico in about 32° 30' n. lat., and extending throughout the continent to the Polar sea; terminating west of the Mackenzie river, in lat. 69° n., lon. 135° w. The Rocky mountains in the United States are divided into two parts in Southern Wyoming by a tract of elevated plateaus. The chief groups of the southern half are the Front or Colorado range, which in Wyoming has a mean elevation of 9000 feet (at Evan's Pass, where it is crossed by the Union Pacific railway 8269 feet). In Colorado it increases to a mean height of 13,000 feet, its highest points being Gray's Peak (14,341 feet), Long's Peak (14,271 feet), and Pike's Peak (14,147 feet). The Sawatch range, south of the Arkansas river, has its highest peak in Mount Harvard (14,375 feet), with passes at an elevation of from 12,000 to 13,000 feet. The "Parks" of Colorado are high mountain valleys, known as North, Middle, South, and San Luis parks, with an elevation of

from 6000 to 10,000 feet, surrounded by ranges 3000 to 4000 feet higher. The west border of the San Luis park is formed by the San Juan range with at least a dozen peaks over 14,000 feet, and between one and two hundred above 13,000 feet. On the northeastern side this park is bounded by the Sangre de Cristo range, in which is Blanca peak (14,464 feet). The Uintah range, directly west of North park, has several points above 13,000 feet; and the Wahsatch range, which forms the western limit of the southern division of the Rocky mountains, rises to a height of 12,000 feet just east of Salt Lake City. The northern division of the Rocky mountains, with the exception of the Wind river range and the Yellowstone region (see Yellowstone), is lower and has less impressive scenery than the southern. In Idaho and Montana the groups are more irregular in outline than in the south, and the division into ranges more uncertain. Of these the Bitter Root mountains in part of their course form the divide between the Missouri and the Columbia. There two ranges reach altitudes of upward of 9000 feet, and are crossed by a number of passes at elevations of from 5500 to 6500 feet. The Northern Pacific railway crosses at Mullan's pass (5548 feet) through a tunnel 3850 feet long. The Crazy mountains, north of the Yellowstone, reach a height of 11,000 feet; other groups are the Big Horn mountains and the Black Hills, whose highest point is Mount Harvey (9700 feet). The highest peaks yet accurately measured in the Canadian Rocky mountains proper are Robson peak (13,700 feet) and Athabasca (13,500). Formerly the Canadian Rockies were regarded as culminating in Mount Brown, to which a height of 16,000 feet was assigned. Mount Logan (19,500) and Mount St. Elias (13,000), on or near the Alaska frontier, do not properly belong to the range. The Rocky mountains contain some of the finest scenery in the world, and are especially rich in deposits of gold, silver, iron, copper, etc.

ROCKY MOUNTAIN WHITE GOAT, The hair is long, especially about the fore quarters, and beneath it is a wooly underfur. It is about three feet high at the shoulders, which are somewhat arched



Rocky Mountain goat.

or humped, while the head is carried low. The nose is hairy, there is a beard, and the horns, present in both sexes, are slender, smooth, backward-curving, eight to ten inches long and black, which is also the color of the small hoofs. Its home is the mountains from the "high

sierras" of California and the central Rocky mountains to Alaska. Its long silky coat and its pure white color indicate a snowy habitat, and this animal is an inhabitant of the glacial peaks and the great snow-fields alone, rarely coming down even as low as the timber-line, but finding its foliage among the alpine pastures that border the glaciers. It climbs with astonishing agility.

ROCO'CO, a debased variety of the Louis-Quatorze style of ornament, pro-



Rococo ornament.

ceeding from it through the degeneracy of the Louis-Quinze. It is generally a meaningless assemblage of scrolls and crimped conventional shell-work, wrought into all sorts of irregular and



Rococo—An interior in Schloss Bruchsal, Baden, Germany.

indescribable forms, without individuality and without expression.

RODENTIA, or **RODENTS**, an order of mammalia, comprising the gnawing animals, such as rats, mice, squirrels, rabbits, etc. They are distinguished by the following characteristics; the teeth are limited to molars and incisors, canines, being entirely absent; the molars have tuberculated or flattish crowns, and are especially adapted for the attrition of food; the incisors are long, and spring from permanent pulps, thus being continually reproduced and shoved outward from their bases. In the typical species the outer faces of the incisors are covered with hard enamel, but not the inner ones, hence the latter are soft and wear away faster than the anterior surfaces, thus keeping a sharp edge on the teeth. The digits are generally four or five in number, and are provided with claws. The intestine is long, and the cæcum generally large. The brain is almost destitute of convolutions. The eyes are placed laterally.

The rodentia are divided into two

main divisions or sub-orders. One represented by mice, rats, squirrels, marmots, beavers, porcupines, etc., having the incisors strictly limited to two in each jaw; and the other comprehending hares and rabbits, distinguished by four incisors in the upper jaw and two in the lower.

RODNEY, George Brydges, Baron Rodney, British naval hero, born in 1718 at Walton-upon-Thames. In 1759, having been promoted to the rank of admiral, he bombarded Havre de Grâce in face of the French fleet. In 1726 he reduced Martinique, and on his return was rewarded with a baronetcy. In



Lord Rodney.

1779 he was appointed to the chief command on the West India station, and in January, 1780, completely defeated a Spanish fleet under Langara off Cape St. Vincent. On April 12, 1782, he obtained a decisive victory over the French fleet under De Grasse. He died 21st May, 1792.

ROE, Edward Payson, American clergyman and novelist, was born in Moodna, Orange co., N. Y., in 1838. He was from 1865 until 1874 pastor of the Presbyterian church at Highland Falls, N. Y., after which he gave himself up to lecturing, writing, and fruit culture. His first novel, *Barriers Burned Away*, a story suggested by the Chicago fire, met with great success. All of his novels have been popular. Among them are *What Can She Do*, *Opening of a Chestnut Burr*, *A Face Illumined*, *Near to Nature's Heart*. He died in 1888.

ROEBUCK, Roe-deer, a European deer of small size, the adult measuring about 2 feet at the shoulders. The horns or antlers are small, and provided with three short branches only. The general body-color is brown, whitish beneath. These animals inhabit mountainous and wooded districts. When irritated or alarmed they may prove very dangerous adversaries, and are able to inflict severe wounds with their antlers. See Reebuck.

ROENTGEN (rönt'gen) Wilhelm Konrad, German physicist, was born at Lennep, in Rhenish Prussia in 1845. He received his doctor's degree in 1869 at the University of Zurich. In 1899 he was appointed professor of experimental physics at the University of Munich. He discovered the rays which bear his name in 1895. For this discovery he received the Rumford medal of the Royal society of London and the Barnard

medal of Columbia University, awarded in 1900 for the greatest discovery in science during the preceding five years. (See X-Rays.)

ROGERS, John, American sculptor, was born in Salem, Mass., in 1829. He exhibited the "Slave Auction" in 1860, and in 1860-65 he executed a series of war statuette groups in gray clay, among which were the "Picket Guard," "One More Shot," and "Union Refugees." Other statuette groups illustrate passages from Shakespeare, Irving's Rip Van Winkle, and Longfellow's Miles Standish ("John Alden and Priscilla"). His ambitious efforts include the equestrian statue in bronze of General Reynolds in front of the City Hall, Philadelphia, and a bronze group of "Ichabod Crane and the Headless Horseman." He died in 1904.

ROGERS, Randolph, American sculptor, was born at Waterloo, New York, in 1825. Among his works are a statue of "John Adams" in the cemetery at Mount Auburn, near Boston; the bronze doors of the new capitol extension in Washington, the bas-reliefs of which represent the principal events of the career of Columbus; and figures of Marshall, Mason, and Nelson for the Washington monument at Richmond, Va. His other works include a colossal bronze statue of Lincoln for Philadelphia; the "Genius of Connecticut" for the state capitol in Hartford; and a statue of W. H. Seward in New York. He died in 1892.

ROGERS, Samuel, English poet, born at Stoke-Newington, London, July 30, 1763; died 18th December, 1855. His first appearance before the public was in 1786, when he gave to the world his Ode to Superstition, and other Poems. The Pleasures of Memory, with which his name is principally identified, appeared in 1792, and An Epistle to a Friend (1798). In 1812 he published The Voyage of Columbus, a fragment; in 1814, Jacqueline, a tale; in 1819, Human Life; and in 1822, Italy, a descriptive poem in blank verse.

ROGERS, William Augustus, American astronomer and physicist, was born in Waterford, Conn., in 1832. He mapped a part of the skies north of the zenith and published "Observations" in the Annals of the observatory. His most important work was in the field of micrometry and included the construction of a dividing engine of high precision. His copies of English and French standards of length, obtained in 1880, are in regular use by American astronomers. He died in 1898.

ROGUE, in law, a vagrant or vagabond. Persons of this character were, by the ancient laws of England, to be punished by whipping and having the ear bored with a hot iron. The term rogues and vagabonds is given to various definite classes of persons, such as fortune-tellers, persons collecting alms under false pretenses, persons deserting their families and leaving them chargeable to the parish, persons wandering about as vagrants without visible means of subsistence, persons found on any premises for an unlawful purpose, and others. Rogues and vagabonds may be summarily committed to prison for three months with hard labor. See Vagrant.

ROHAN (rō-ān), Henri, Duke of, French Protestant leader, born in 1579. In his sixteenth year he joined the court of Henry IV., and after the death of the latter in 1610 became chief of the Huguenots. After the fall of Rochelle (1628) and the peace of 1629 Rohan withdrew from France and wrote his *Memoires Sur les Choses Advenues en France depuis la Mort de Henry IV. Mémoires sur la Guerre de la Valteline Les Intérêts des Princes, and Discours Politiques*. He died in 1639.

ROHAN, Louis René Edouard, Prince de, Cardinal-bishop of Strasburg, was born in 1734 at Paris. In 1772 he went as ambassador to the court of Vienna. He derives his notoriety, however, chiefly from the affair of the necklace. He was then grand almoner of France, and being thrown into the Bastille, continued in prison more than a year, when he was acquitted and released by the parliament of Paris, August, 1786. He died in Germany in 1803.

ROHILKHAND, or **ROHILCUND**, a division of British India, United Provinces; area, 10,885 sq. miles; pop. 5,343,674. It is subdivided into the districts Bijnur, Muradabad, Budaon, Bareilly, Pilibhit, and Shahjahanpur. It incloses the native principality of Rampur.

ROHLFS (rōlfs), Friedrich Gerhard, a celebrated African traveler, born in 1831 at Vegesack, Germany. His works include, among others: *Journey through Morocco* (1869), *Land and People of Africa* (1870), *Across Africa* (1874-75), *Journey from Tripoli to the Kufra Oasis* (1881), *My Mission to Abyssinia* (1883). He died in 1890.

ROLAND, or **ORLANDO**, a celebrated hero of the romances of chivalry, and one of the paladins of Charlemagne, of whom he is represented as the nephew. His character is that of a brave, unsuspicious, and loyal warrior, but somewhat simple in his disposition. According to the Song of Roland, an old French epic, he was killed at the battle of Roncevalles after a desperate struggle with the Saracens, who had attacked Charlemagne's rear-guard. The celebrated romantic epics of Boiardo (Orlando Innamorato) and Ariosto (Orlando Furioso) relate to Roland and his exploits.

ROLFE, William James, an American Shakespearean scholar and educator, born in Newburyport, Mass., in 1827. In 1867 he edited an edition of Craik's English of Shakespeare. This led to the preparation of a complete edition of Shakespeare (40 vols). He also edited the select Poems of Goldsmith; of Gray; of Tennyson; Enoch Arden and Other Poems; Scott's Complete Poems; Byron's Childe Harold; Macaulay's Lays of Ancient Rome; Wordsworth; In Memoriam; Idyls of the King; and a complete edition of Tennyson; Shakespeare, the Boy; Life of Shakespeare.

ROLLER, a genus of birds, generally of small size. The common roller is found in Europe as a summer visitor, but only occasionally visits Great Britain. Africa appears to be its native country. In size the roller averages the common jay. The plumage is in general

an assemblage of blue and green, mixed with white, and heightened by the contrast of more sombre colors. The voice is noisy and harsh. The food consists of insects, small reptiles, and fruit.

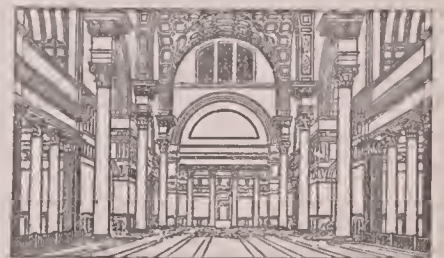


W. J. Rolfe

ROLLIN (rol-an), Charles, a French historian, born at Paris in 1661, studied theology, obtained a chair in the Collège de France, and latterly was a rector of the University of Paris. He died in 1741. His *Ancient History* was long popular in English, but is now quite out of date.

ROLLING-MILL, a combination of machinery used in the manufacture of malleable iron and other metals of the same nature. It consists of one or more pairs of iron rollers, whose surfaces are made to revolve nearly in contact with each other, while the heated metal is passed between them, and thereby subjected to a strong pressure. The first rolling is to expel the scoriae and other impurities, after which the mass of metal is cut into suitable lengths, which are piled on one another and reheated, when the mass which has been partially fused is again passed through the rollers. This second rolling determines its form into a hoop, rail, bar, or plate according to the form given to the surfaces of the rollers. See Iron.

ROMAN ARCHITECTURE, the style of building practiced by the ancient



Roman architecture.
Great hall in the baths of Caracalla.

Romans. Derived on the one hand from the Etruscans, and on the other from

the Greeks, the fusion ultimately resulted in an independent style. Its essential characteristics are, the employment of the Tuscan and the Composite order, and the introduction and free use of the semicircular arch and arcade, together with the use of rounded and prominent mouldings, often profusely decorated. In Roman architecture the great feature is the employment of the arch as well as the lintel, while Greek architecture employs the lintel only. It produced various constructions, unknown to Greek art, such as amphitheatres, circuses, aqueducts, bridges, baths, triumphal arches, etc. It has thus been of vastly greater practical utility than the Greek, and is bold and imposing in appearance. The column as a support, being no longer exclusively a necessity, was often of a purely decorative character, and was largely used in front of closed walls, in domes above circular interiors, and in the construction of cylindrical and groined vaulting over oblong spaces. The arch was freely used internally as well as externally, and became an important decorative feature of interiors. The Roman temples as a rule, from the similarity of the theogony to that of the Greeks were disposed after the Greek form, but a purely Roman type is seen in the circular temples such as the Pantheon at Rome, the temple of the Sibyl at Tivoli, the temple of Vesta at Rome, etc. This style of architecture was introduced by the Romans into all their colonies and provinces—vast existing remains evidencing the solid character of the buildings. It reached its highest stage during the reign of Augustus (B.C. 27), and after the translation of the seat of empire to Byzantium it degenerated and ultimately gave place to a debased style.

ROMAN CANDLE, a kind of firework consisting of a tube which discharges in rapid succession a series of white or colored stars or balls.

ROMAN CATHOLIC CHURCH, that society of Christians which acknowledges the bishop of Rome as its visible head. The foundation of the Christian church at Rome is uncertain, but St. Paul did not visit Rome until after he had written his Epistle to the Romans. The claim of supremacy on the part of the bishop of Rome is based on the belief that our Lord conferred on Peter a primacy of jurisdiction; that that apostle fixed his see at Rome; and that the bishops of Rome, in unbroken succession from Peter, have succeeded to his prerogative of supremacy. The distinctive character of the Roman church is the supremacy of the papacy. Its doctrines are to be found in the Apostles' creed, the Nicene creed, the Athanasian, and that of Pius IV. The latter added the articles on transubstantiation, invocation of saints, and others which chiefly distinguish the Roman from other Christian communities. The dogmas of the immaculate conception of the Virgin Mary and papal infallibility are recent additions. Roman Catholics believe that the mass is the mystical sacrifice of the body and blood of Christ, that the body and blood are really present in the eucharist, and that under either kind

Christ is received whole and entire. They also believe in purgatory, that the Virgin Mary and the saints are to be honored and invoked, and that honor and veneration are to be given to their images. Seven sacraments are recognized, viz.: Baptism, confirmation, the holy eucharist, penance, extreme unction, holy orders, and matrimony. Fasting and confession form part of the discipline. The clergy of the church in the west are bound by a vow of celibacy implied in their ordination as sub-deacons. The clergy of those Greek and Armenian churches that are united in communion with the see of Rome, may receive orders if married, but may not marry after ordination. Under the generic name of Roman Catholics are comprised all churches which recognize the supremacy of the Pope of Rome, including the United Greeks, Slavonians, Ruthenians, Syrians, Copts, and Armenians. The supreme council or senate of the Roman church is the college of cardinals, 70 in number, who are the advisors of the sovereign, and, on the death of the pontiff, elect his successor. The total number of members of the Roman Catholic church has been estimated at 229,000,000.

ROMANCE, a fictitious narrative in prose or verse, the interest of which turns upon incidents either marvelous or uncommon. The name is derived from the class of languages in which such narratives in modern times were first widely known and circulated: these were the French, Italian, and Spanish, called the Romance Languages.

ROMANCE LANGUAGES, those languages of South Europe which owe their origin to the language of Rome—the Latin—and to the spread of Roman dominion and civilization. They include the Italian, French, Provençal, Spanish, Portuguese, Roumanian, and Romansch. Their basis was not, however, the classic Latin of literature, but the popular Roman language—the *Lingua Romana rustica* spoken by the Roman soldiers, colonists, and others, and variously modified by uneducated speakers of the different peoples among whom it became the general means of communication. In all of these tongues Latin is the chief ingredient, and a knowledge of Latin helps very greatly in acquiring a knowledge of them.

ROMANESQUE ARCHITECTURE, a general and rather vague term applied to the styles of architecture which prevailed in Western Europe from the 5th to the 12th century. The Romanesque may be separated into two divisions: (a) the debased Roman, in use from the 5th to the 8th century; and (b) the later Romanesque of the 8th to the 12th century, which comprises the Lombard, Rhenish or German, and Norman styles. The former is characterized by a pretty close imitation of the features of Roman, with changes in the mode of their application and distribution; the latter, while based on Roman form, is Gothic in spirit, has a predominance of vertical lines, and introduces a number of new features and greatly modifies others. To the former belong especially churches of the basilica type in various cities of Italy, as also a number of circular churches, and many of these buildings

have a certain affinity to the Byzantine type of architecture. The semicircular arch is used throughout the entire period and the general expression of the buildings is rather severe. It assumes different phases in different countries. In Romanesque churches of the 9th and the 11th century the prevailing features are: that in plan the upper limb of the cross is short and terminated by a semicircular or semi-octagonal apse; the tran-



End view and plan of Romanesque church of Laach (Rhenish Prussia).

septs frequently short, and often rounded externally; the walls very thick, without buttresses or with buttresses having very slight projection; the pillars thick, sometimes simply cylindrical or clustered in large masses, and either plain or with but simple decoration; the capitals of cushion form, sometimes plain, at others enriched with various ornaments peculiar to the style. Externally, roofs of moderate pitch, towers square or octagonal, low or of moderate elevation, and with terminations of pyramidal character; windows round-headed and without mullions; doorways moderately recessed and



Romanesque ornament.

highly decorated with the cable, chevron and other distinctive ornaments; arcades much employed for decoration, frequently by a continuous series round the upper part of the apse and round the upper parts of transepts also, when the transepts are rounded externally. The principal front is frequently flat and decorated with arcades in successive rows from the apex of the roof till just above the portals, producing a rich effect, as at Pisa cathedral.

ROMANS, Epistle to the, the most elaborate, and, in a doctrinal point of

view, the most important composition of St. Paul. It sets forth that the gospel doctrine of justification by faith is a power unto salvation to all men, both Jews and Gentiles. The writer then deplores the rejection of the Jews, and in the practical part admonishes the Romans to exercise the various gifts bestowed upon each in a spirit of love and humility; he especially urges the strong to bear with the weak, and concludes with various salutations and directions. In modern times doubts have been thrown upon the authenticity of the concluding portion of this epistle, some critics regarding the whole of chapter xvi. as spurious.

ROMANTIC, a term used in literature as contradistinguished to antique or classic. The name romantic school was assumed about the beginning of the 19th century by a number of young poets and critics in Germany, the Schlegels, Novalis, Tieck, etc., whose efforts were directed to the overthrow of the artificial rhetoric and unimaginative pedantry of the French school of poetry. The name is also given to a similar school which arose in France between twenty and thirty years later, and which had a long struggle for supremacy with the older classic school; Victor Hugo, Lamartine, etc., were the leaders.

ROME, the most famous state of ancient times, originally comprising little more than the city of Rome, latterly an empire embracing a great part of Europe, North Africa, and Western Asia. The origin of Rome is generally assigned to the year 753 B.C., at which time a band of Latins, one of the peoples of Central Italy, founded a small town on the left bank of the Tiber, about 15 miles from the sea, the population being subsequently augmented by the addition of Sabines and Etruscans.

Toward the end of the 5th century B.C., after extending her territory to the south, Rome turned her arms against Etruria in the north. For ten years (405-396) the important city of Veii is said to have been besieged, till in the latter year it was taken by Camillus, and the capture of this city was followed by the submission of all the other towns in the south of Etruria.

During the period 343-264 Rome was engaged in many important wars, the chief of which were the four Samnite wars, the great Latin war, the war with the Greek cities of Southern Italy, and the war with Pyrrhus, the invader of Italy from Greece. Rome having conquered Italy, felt at liberty to contend for the possession of Sicily, at this time almost entirely under the dominion of the great maritime power of Carthage. An opportunity for interfering in Sicilian affairs was easily found, and in 264 B.C. the First Punic or Carthaginian war began. It lasted for more than twenty years, caused the loss of three large fleets to the Romans, and the defeat of a Roman army under Regulus in Africa; but in 241 a great victory over the Carthaginian fleet caused the latter power to sue for peace.

Meanwhile the Carthaginians had been making considerable conquests in Spain, which awakened the alarm and envy of the Romans, and induced them

to enter into a defensive alliance with the Greek colony of Saguntum, near the east coast of that country. In 221 B.C. Hannibal, the son of Hamilcar Barca, who had bravely and skilfully maintained the Carthaginian arms in Sicily, and had since founded and in great part established the Carthaginian empire in Spain, succeeded to the command of the Carthaginian forces. The taking of Saguntum, a city allied to Rome, occasioned the Second Punic war, during which Hannibal traversed Gaul, crossed the Alps, and invaded Italy. The war lasted for sixteen years (218-202 B.C.); and was carried on with consummate generalship on the part of Hannibal, who inflicted on the Romans one of the most disastrous defeats they ever sustained, at Cannæ, in 216 B.C. This great man was ill supported by his country, and the war terminated in favor of the Romans through the defeat of Hannibal by P. Cornelius Scipio at Zama in Africa in 202 B.C. (See Hannibal.) One of the results was that the power of Carthage was broken and Spain practically became a Roman possession.

Philip V. of Macedonia had favored Hannibal, and so gave Rome a pretext to mix in Grecian affairs. The result was that Macedonia was made a Roman province (148 B.C.), while in the same year that Carthage fell Corinth was sacked, and soon after Greece was organized into the province of Achaia. Previously Antiochus the Great of Syria had been defeated by the Romans and part of Asia Minor brought into vassalage to Rome. In the east Rome intrigued where she could, and fought when she was compelled, and by disorganizing states made them first her dependencies and then her provinces. In 130 B.C. she received by bequest the dominions of Attalus III. of Pergamus (Mysia, Lydia, Caria, and Phrygia), which was formed into the province of Asia. A serious war, almost of the nature of a civil war, followed with the Roman allies in Italy, who rose in 90 B.C. to demand the right of equal citizenship with the people of Rome. This war, known as the Social war, lasted for two years (90-88 B.C.), and ended in the victory of the Romans, who, however, found it advisable to concede the franchise to the Italian tribes to prevent another rising. The war had been concluded by Sulla, between whom and Marius great rivalry prevailed; and now sprang up the first Roman civil war, a struggle between the party of Marius (the people) and that of Sulla (the nobles). Sulla, the consul for 88, was on the point of starting for Asia to attack Mithridates, king of Pontus, a war that promised both glory and treasure. Marius was eager for the same command, and through intrigue on his behalf the populace deprived Sulla of the chief command and gave it to Marius. Thereupon Sulla marched on Rome with his legions, forced Marius to flee to Africa, and then proceeded to the Mithridatic war. In his absence Marius returned, wreaked a bloody vengeance on the partisans of his rival, and died after being appointed consul for the seventh time (86 B.C.). Three years later Sulla came back from Asia, having brought the Mithridatic war to a satis-

factory conclusion, and now felt himself at liberty to take his revenge on the Marian party for the atrocities it had been guilty of toward his own party in his absence; and he took it in full measure. He was appointed dictator for an unlimited term (81 B.C.), and as such passed a series of measures the general object of which was to restore to the constitution its former aristocratic or oligarchical character. In the beginning of 79 B.C. Sulla retired into private life, and he died the year following.

The man who now came most prominently before the public eye was Pompey one of Sulla's generals. His first important achievement was the subjugation of the remnant of the democratic or Marian party that had gathered round Sertorius in Spain (76-72 B.C.). On his return to Italy he extinguished all that remained of an insurrection of slaves, already crushed by Crassus (71), and in 70 B.C. was consul along with Crassus. In 67 B.C. he drove the pirates from the Mediterranean, and afterward reduced Cilicia, which he made into a Roman province. He was then appointed to continue the war that had been renewed against Mithridates, king of Pontus, whom he finally subdued, forming part of his dominions in Asia Minor into a Roman province, and distributing the rest among kings who were the vassals of Rome. In 64 B.C. Pompey put an end to the dynasty of the Seleucids in Syria, and converted their kingdom into a province, and in 63 B.C. advanced southward into Judea, which he made tributary to Rome. All these arrangements were made by him of his own authority. In the very year in which they were completed a member of the aristocratic party, the great orator Cicero, had earned great distinction by detecting and frustrating the Catilinarian conspiracy.

Only three years after these events (60 B.C.) a union took place at Rome of great importance in the history immediately subsequent. Caius Julius Cæsar, a man of aristocratic family who had attached himself to the democratic party and had become very popular, joined Pompey and Crassus in what is called the first triumvirate, and practically the three took the government of Rome into their own hands. On the part of Cæsar, who was now elected consul, this was the first step in a career which culminated in the overthrow of the republic, and his own elevation to the position of sovereign of the empire. After the death of Crassus (53 B.C.) came the struggle for supreme power between Cæsar and Pompey. Cæsar had gained great glory by the conquest of Gaul, but now at Pompey's instigation was called on to resign his command and disband his army. Upon this he entered Italy, drove Pompey into Greece, and the short civil war of 49-48 B.C., and the great battle of Pharsalia in the latter year, decided the struggle in Cæsar's favor. Pompey's army was utterly routed; he himself was compelled to flee, and having gone to Egypt was there murdered. In a short time Cæsar utterly subdued the remains of the Pompeian party and became virtually

king in Rome. Cæsar was assassinated in 44 B.C., and the main result of the conspiracy by which he fell was that the first place in Rome had again to be contested. The competitors this time were Octavianus, the grand-nephew and adopted son of Cæsar, then only nineteen, and Mark Antony, one of Cæsar's generals. In 43 B.C. these two formed with Lepidus what is known as the second triumvirate; and after avenging the death of Cæsar and putting an end to the republican party in the battle of Philippi (42), Octavian and Antony, casting off Lepidus, who was a weakling, divided the empire between them, the former taking Rome and the West and the latter the East. In ten years war broke out between the two, and in the naval battle of Actium (31 B.C.) Antony was defeated, and the whole Roman world lay at the feet of the conqueror, Egypt being also now incorporated. Not long after this Octavian received the title of Augustus, the name by which he is known in history as the first of the Roman emperors.

In his administration of the empire Augustus acted with great judgment, ostensibly adhering to most of the republican forms of government, though he contrived in course of time to obtain for himself all the offices of highest authority. The reign of Augustus is chiefly remarkable as the golden age of Roman literature, but it was a reign also of conquest and territorial acquisition. Before the annexation of Egypt Pannonia had been added to the Roman dominions (35 B.C.), and by the subsequent conquest of Mœsia, Noricum, Rætia, and Vindelicia, the Roman frontier was extended to the Danube along its whole course. Gaul and Spain also were now finally and completely subdued. The empire of Augustus thus stretched from the Atlantic to the Euphrates, and from the Rhine and the Danube to the deserts of Africa. This emperor died in 14 A.D. His reign is above all memorable for the birth of Christ in B.C. 4. Augustus was followed by a series of emperors forming, when he and Julius Cæsar are included, the sovereigns known as the Twelve Cæsars. The names of his successors and the dates of their deaths are: Tiberius, 37 A.D.; Caligula, 41; Claudius, 54; Nero, 68; Galba, 69; Otho, 69; Vitellius, 69; Vespasian, 79; Titus, 81; and Domitian, 96. Nerva's reign was short (96-98) but beneficent, and he was followed by four emperors, Trajan, Hadrian, Antoninus Pius, and Marcus Aurelius, who together reigned for more than eighty years, and under whom the countries making up the Roman empire enjoyed in common more good government, peace, and prosperity than ever before or after. Trajan (98-117) was a warlike prince, and added several provinces to the Roman empire. Hadrian (117-138), the adopted son of Trajan, devoted himself entirely to the internal affairs of his empire. It was in his reign that the southern Roman wall, or rampart between the Tynce and the Solway Firth, was erected. Antoninus Pius (138-161) was likewise the adopted son of his predecessor. In his reign the northern wall

in Britain, between the Forth and Clyde, was constructed. The next emperor, Marcus Aurelius (161-180), was both the son-in-law and the adopted son of Antoninus Pius. He combined the qualities of a philosopher with those of an able and energetic ruler.

Commodus (180-192), the son and successor of Aurelius, inherited none of his father's good qualities, and his reign, from which Gibbon dates the decline of the Roman empire, presents a complete contrast to those of the five preceding emperors. In the long list of emperors who succeeded may be noted Septimius Severus, who reigned from 193 to 211, during which time he restored the empire to its former prestige. He reconquered Mesopotamia from the Parthians, but in Britain he confined the Roman province to the limit of Hadrian's Wall, which he restored. He died at York. Alexander Severus, who reigned from 222 till 235, was also an able ruler, and was also the first emperor who openly extended his protection to the Christians. His death was followed by a period of the greatest confusion. The empire was again consolidated under Aurelian (270-275), who subdued all the other claimants to the imperial dignity, and put an end to the Kingdom of Palmyra, which was governed by the heroic Zenobia. The reign of Diocletian (284-305) is remarkable as affording the first example of that division of the empire which ultimately led to the formation of the empire of the West and the empire of the East. This arrangement temporarily worked well, but in 323 Constantine, the son of Constantius, was left sole master of the empire. Ever since the time of Augustus and Tiberius, Christianity had been spreading in the Roman empire, notwithstanding terrible persecutions. The number of churches and congregations had increased in every city; the old religion had died out, and very few believed in it; so at last Constantine judged it wise to make the Christian religion the religion of the empire. He also removed the seat of government from Rome to Byzantium, which was hence called Constantinople (330), and completely reorganized the imperial administration. Constantine died in 337. The empire was left among his three sons, of whom Constantius became sole ruler in 353. The next emperor, Julian the Apostate, sought to restore the old religion but in vain. He was an able ruler, but fell in battle against the Persians in 363. He was succeeded by Jovian, who reigned less than one year; and after his death (364) the empire was again divided, Valens (364-378) obtaining the eastern portion, and Valentinian (364-375) the western. From this division, which took place in 364, the final separation of the eastern and western empires is often dated. In the reigns of Valens and Valentinian great hordes of Huns streamed into Europe from the steppes of Central Asia. After subduing the eastern Goths (Ostrogoths) they attacked those of the west (Visigoths); but these, since they had already been converted to Christianity, were allowed by Valens to cross from the left to the right

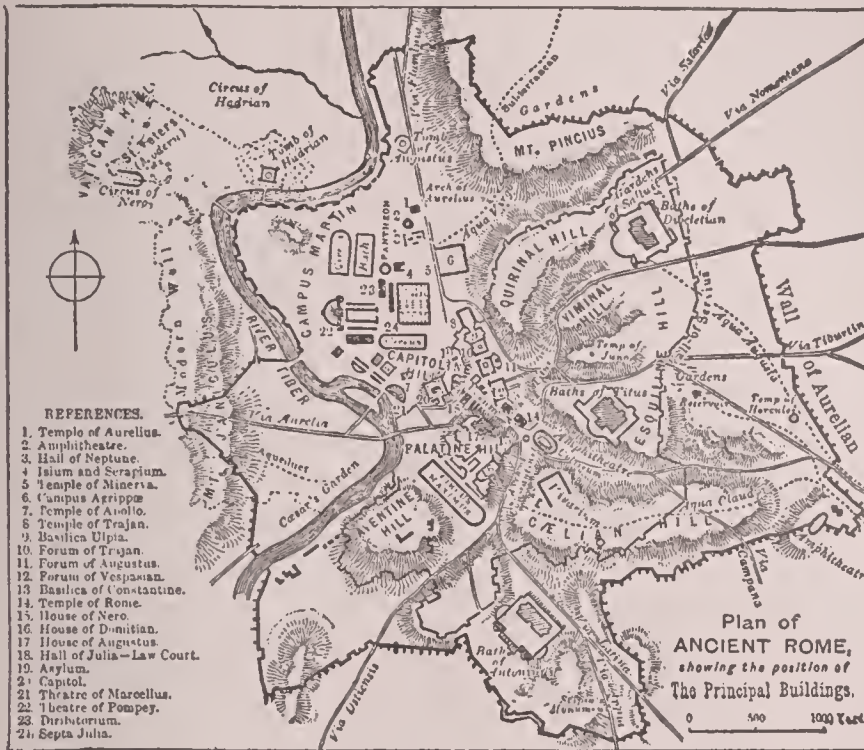
bank of the Danube, and settle in Mœsia. In their new homes they found themselves exposed to the oppression and rapacity of the Roman governors, and when they could no longer brook such treatment they rose in rebellion, and defeated Valens in the sanguinary battle of Adrianople, in the flight from which the emperor lost his life (378). His son Gratianus created the heathen Theodosius co-regent, and intrusted him with the administration of the East. Theodosius became a Christian, fought successfully against the Western Goths, but was obliged to accept them as allies in their abodes in Mœsia and Thrace. In 394 the whole empire was reunited for the last time under Theodosius. After his death (395) the empire was divided between his two sons, Honorius and Arcadius, and the eastern and western sections became permanent divisions of the empire, the latter being now under Honorius. For the further history of the empire of the East, see Byzantine Empire.

In 402 Alaric, king of the Visigoths who were settled on the south of the Danube, was incited to invade Italy, but he was soon forced to withdraw on account of the losses he suffered in battle (403). Scarcely had these enemies retreated when great hosts of heathen, Teutonic tribes, Vandals, Burgundians, Suevi, and others, made an irruption into Italy on the north; but these also were overcome by Stilicho, the guardian of the youthful emperor Honorius, in the battle of Fæsulæ (or Florence), and compelled to withdraw (406). The Burgundians now settled in part of Gaul, while the Vandals and Suevi crossed the Pyrenees into Spain. In 408 Alaric marched into Italy, advanced up to the walls of Rome, and ultimately took the city by storm (410). Shortly after Alaric died, and his brother-in-law Athaulf (Adolphus) concluded a treaty with Honorius, and retired into Gaul, where the Visigoths founded in the southwest a kingdom that extended originally from the Garonne to the Ebro (412). About this time also the Romans practically surrendered Britain, by withdrawing their forces from it, and thus leaving it a prey to Teutonic pirates and northern savages. In 429 the Vandals wrested the province of Africa from the empire and set up a Vandalic kingdom in its place. In 452 the Huns left their settlements in immense numbers under their king Attila, destroyed Aquileia, took Milan, Pavia, Verona, and Padua by storm, laid waste the fruitful valley of the Po, and were already advancing on Rome when the Roman bishop, Leo I., succeeded in inducing them to conclude a peace with Valentinian, and withdraw. Soon after their leader Attila died (453), and after that the Huns were no longer formidable. Two years after the death of Attila, Eudoxia, the widow of Valentinian, the successor of Honorius, invited the assistance of the Vandals from Africa, who under their leader Genseric proceeded to Rome which they took and afterward plundered for fourteen days, showing so little regard to the works of art it contained as to give to the word vandalism the sense it still expresses (455). They

then returned to Africa with their booty and prisoners. After the withdrawal of the Vandals, Avitus, a Gaul, was installed emperor. Under him the Suevian Ricimer, the commander of the foreign mercenaries at Rome, attained such influence as to be able to set up and depose emperors at his pleasure. The last of the so-called Roman emperors was

of various gods (now church of S. Maria Rotonda), is still in excellent preservation. It is a great circular building with a dome-roof of stone 140 feet wide and 140 feet high, a marvel of construction, being 2 feet wider than the great dome of St. Peter's. The interior is lighted by a single aperture in the center of the dome. Other temples were the Temple of

Aurelian erected to the east of the Quirinal; and the magnificent temple of Venus, which Cæsar caused to be built to her as the origin of his family. The principal palace of ancient Rome was the Palatium or imperial palace, on the Palatine Hill, a private dwelling-house enlarged and adopted as the imperial residence by Augustus. Succeeding emperors extended and beautified it. Nero built an immense palace which was burned in the great fire. He began to replace it by another of similar extent, which was not completed till the reign of Domitian. Among the theaters, those of Pompey, Cornelius Balbus, and Marcellus were the most celebrated. That of Pompey, in the Campus Martius, was capable of containing 40,000 persons. Of the Theater of Marcellus, completed B.C. 13 a portion still remains. The most magnificent of the amphitheaters was that of Titus, completed A.D. 80, now known as the Coliseum or Colosseum. Although only one-third of the gigantic structure remains, the ruins are still stupendous. The principal of the circuses was the Circus Maximus, between the Palatine and Aventine, which was capable of containing 260,000 spectators. With slight exception its walls have entirely disappeared, but its form is still distinctly traceable. The porticoes or colonnades, which were public places used for recreation or for the transaction of business, were numerous in the ancient city, as were also the basilicas or public halls. Among them may be noticed the splendid Basilica Julia, commenced by Cæsar and completed by Augustus; and the Basilica Portia, which was built by Cato the censor. The public baths or thermæ in Rome were also very numerous. The largest were the Thermæ of Titus, part of the substructure of which may still be seen on the Esquiline Hill; the Thermæ of Caracalla, even larger, extensive remains of which still

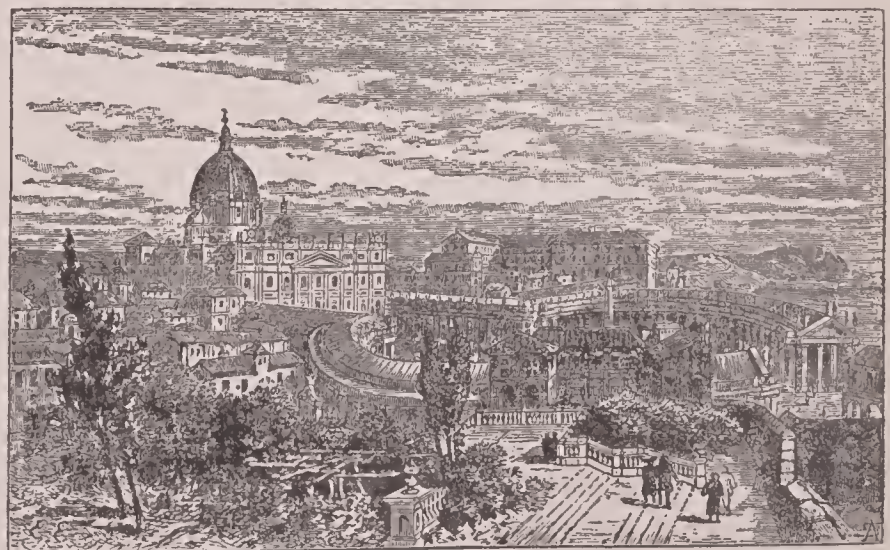


Romulus Augustulus (475–476 A.D.). His election had been secured through the aid of the German troops in the pay of Rome, and these demanded as a reward a third part of the soil of Italy. When this demand was refused, Odoacer, one of the boldest of their leaders, deposed Romulus, to whom he allowed a residence in Lower Italy with a pension, and assumed to himself the title of King of Italy, thus putting an end to the Western Roman empire, A.D. 476.

ROME, the capital of Italy, as formerly of the Roman empire, republic, and kingdom, and long the religious center of western Christendom, is one of the most ancient and interesting cities of the world. It stands on both sides of the Tiber, about 15 miles from the sea. The ancient city occupied a series of eminences of small elevation known as the seven hills of Rome (the Capitoline, the Palatine, the Aventine, the Quirinal, the Viminal, the Esquiline, and the Caelian hill), while a small portion stood on the other side of the river, embracing an eighth hill (Janiculum). The city is tolerably healthy during most of the year, but in late summer and early autumn malaria prevails to some extent.

Ancient Rome was adorned with a vast number of splendid buildings, including temples, palaces, public halls, theaters, amphitheaters, baths, porticoes, monuments, etc., of many of which we can now form only a very imperfect idea. The oldest and most sacred temple was that of Jupiter Capitolinus, on the Capitoline Hill. The Pantheon, a temple

Apollo, which Augustus built of white marble, on the Palatine, containing a splendid library, which served as a place of resort to the poets; the Temple of Minerva, which Pompey built in the Campus Martius, and which Augustus covered with bronze; the Temple of



Rome.—St. Peter's and the Vatican.

Peace, once the richest and most beautiful temple in Rome, built by Vespasian, in the Via Sacra, which contained the treasures of the temple of Jerusalem, a splendid library, and other curiosities, but was burned under the reign of Commodus; the temple of the Sun, which

exist in the southeast of the city; and the Thermæ of Diocletian, the largest and most magnificent of all, part of which is converted into a church. Of the triumphal arches the most celebrated are those of Titus (A.D. 81), Severus (A.D. 203), and that of Constantine (A.D.

311), all in or near the Forum and all well-preserved structures; that of Drusus (B.C. 8) in the Appian Way, much mutilated; that of Gallienus (A.D. 262) on the Esquiline Hill, in a degraded style of architecture. Among the columns the most beautiful was Trajan's Pillar in the Forum of Trajan, 117 feet in height, still standing. The bas-reliefs with which it is enriched, extending in spiral fashion from base to summit, represent the exploits of Trajan, and contain about 2500 half and whole human figures. A flight of stairs within the pillar leads to the top. The most celebrated of the ancient sewers is the Cloaca Maxima, ascribed to Tarquinius Priscus, a most substantial structure, the outlet of which is still to be seen. The Roman aqueducts were formed by erecting one or several rows of arches superimposed on each other across a valley, and making the structure support a waterway or canal, and by piercing through hills which interrupted the watercourse. Some of them brought water from a distance of upward of 60 miles. Among others, the Acqua Paola, the Acqua Trajana, and the Acqua Marzia, still remain and contribute to the supply of the city, and also its numerous important ornamental fountains. Among the magnificent sepulchral monuments, the chief were the mausoleum of Augustus in the Campus Martius; and that of Hadrian, on the west bank of the Tiber, now the fortress of modern Rome, and known as the Castle of St. Angelo. The city was also rich in splendid private buildings, and in the treasures of art, with which not only the public places and streets, but likewise the residences and gardens of the principal citizens, were ornamented, and of which comparatively few vestiges have survived the ravages of time. The catacombs of Rome are subterranean galleries which were used as burial-places and meeting-places, chiefly by the early Christians, and which extend under the city itself as well as the neighboring country. The chief are the catacombs of Calixtus, St. Prætextatus on the Via Appia; of St. Priscilla 2 miles beyond the Porta Salara; of St. Agnese, outside the Porta Pia; of St. Sebastiano, beneath the church of that name, etc.

Among the principal streets and squares of modern Rome are the Piazza del Popolo immediately within the Porta del Popolo on the north side of the city near the Tiber, with a fine Egyptian obelisk in its center, and two handsome churches in front, standing so far apart from each other and from the adjoining buildings as to leave room for the divergence of three principal streets, the Via di Ripetta, the Corso, and the Via del Babuino. The Corso, recently widened and extended, stretches for upward of a mile in a direct line to its termination at the Piazza di Venezia, not far from the capitol, and is the finest street in the city. The appearance of the capitol has been entirely altered to permit the erection of a monument to Victor Emmanuel. The Via del Babuino proceeds first directly to the Piazza di Spagna, thence to the Quirinal, and by a tunnel opens out on the Esquiline. It contains

a large number of handsome edifices. The whole of the city to the east of this street, and in the triangular space included between it and the Corso, is well aired and healthy, and is regarded as the aristocratic quarter. The Ghetto, or Jews' quarter, which occupied several mean streets parallel to the river and connected by narrow lanes, was cleared away by the municipal improvements in 1889. The city is supplied with good water partly by the above-mentioned aqueducts, which, constructed under the greatest difficulties five-and-twenty centuries ago, still serve the purpose for which they were built, and remain monuments of engineering skill. The chief open spaces besides the Piazza del Popolo are the Piazza S. Pietro, with its extensive colonnade; the Piazza Navona adorned with two churches and three fountains, one at each extremity and the third in the center; the Piazza di Spagna, adorned by a monumental pillar and a magnificent staircase of travertine, leading to the church of Trinità de' Monti, conspicuously seated on an eminence above it; the Piazza Berberini, beside the palace of the same name, adorned by a beautiful fountain; the Piazza Colonna, in the center of the city, with column of Marcus Aurelius; near it, in the Piazza di Monte Citorio, is the spacious Chamber of Deputies. Larger spaces for amusement or exercise have been formed only in a few spots. One of the finest is the Pincio, or "hill of gardens," overlooking the Piazza del Popolo, and commanding a fine view. It is a fashionable drive toward evening, and presents a gay and animated appearance. At a short distance outside the walls on the north of the city is the Villa Borghese, forming a finely-planted and richly-decorated park of 3 miles in circuit, which, though private property, forms the true public park of Rome, and is the favorite resort of all classes. Various localities in and near Rome that were malarious have been rendered healthy by planting eucalyptus trees.

The most remarkable of the churches is of course the cathedral of St. Peter, the largest and most imposing to be found anywhere, for the history and description of which see Peter's (St.). Another remarkable church is that of San Giovanni in Laterano, on an isolated spot near the south wall of the city. It was built by Constantine the Great, destroyed by an earthquake in 896, re-erected (904-911), burned in 1308, restored and decorated by Giotto. Again burned in 1360, rebuilt by Urban IV. and Gregory XI., and has undergone various alterations and additions from 1430 till the present façade was erected in 1734. A modern extension has involved the destruction of the ancient apse. From the central balcony the pope pronounces his benediction on Ascension-day; and the church is the scene of the councils which bear its name. The residence of the popes adjoined this church until the migration to Avignon; it is now occupied by the Gregorian museum of the Lateran. Santa Maria Maggiore, which ranks third among the basilicas, was founded by Pope Liberius (352-366), but has since had many alterations and addi-

tions, the more notable being those of the 15th and 16th centuries. Its interior, adorned with thirty-six Ionic pillars of white marble supporting the nave, and enriched with mosaics, is well preserved and one of the finest of its class. Santa Croce in Gerusalemme, the fourth of the Roman basilicas, takes its name from its supposed possession of a portion of the true cross, and a quantity of earth which was brought from Jerusalem and mixed with its foundation. Another church is that of San Clemente, on the Esquiline, a very ancient church, said to have been founded on the house of Clement, St. Paul's fellow-laborer, by Constantine, and containing a number of interesting frescoes by Masaccio. It consists of a lower and an upper church, and from an archæological point of view is one of the most interesting. Others are Il Gesu, on the Corso, the principal church of the Jesuits, with a façade and cupola by Giacomo della Porta (1577), and an interior enriched with the rarest marbles and several fine paintings, decorated in the most gorgeous style, and containing the monument of Cardinal Bellarmine; Sta. Maria-degli-Angeli, originally a part of Diocletian's Baths, converted into a church by Michael Angelo, one of the most imposing which Rome possesses and containing an altar-piece by Muziano, a fine fresco by Domenichino, and the tomb of Salvator Rosa; Sta. Maria in Ara Cœli, on the Capitoline, a very ancient church approached by a very long flight of stairs, remarkable for its architecture and for containing the figure of the infant Christ called the santissimo bambino; Sta. Maria in Cosmedin, at the northern base of the Aventine, remarkable for its fine Alexandrine pavement and its lofty and beautiful campanile of the 8th century; Sta. Maria sopra Minerva, so called from occupying the site of a temple of that goddess, begun in 1285 and restored 1848-55, remarkable as the only Gothic church in Rome; and Sta. Maria in Domnica or della Navicella, on the Cælian, remarkable for eighteen fine columns of granite and two of porphyry, and the frieze of the nave painted in camaieu by Giulio Romano and Perino del Vaga. Among other notable churches are Sta. Maria della Pace, celebrated for its paintings, particularly the four Sibyls, considered among the most perfect works of Raphael; Sta. Maria del Popolo, interesting from the number of its fine sculptures and paintings (Jonah by Raphael, ceiling frescoes by Pinturicchio and mosaics from Raphael's cartoons by Aloisio della Pace); Sta. Maria in Trastevere, a very ancient church, first mentioned in 449, re-erected by Innocent III. in 1140, and recently restored; San Paolo fuori le Mura, erected to mark the place of St. Paul's martyrdom, founded in 388, and restored and embellished by many of the popes, burned in 1823, and since rebuilt with much splendor. It is of great size, and has double aisles and transepts borne by columns of granite. Above the columns of the nave, aisles, and transepts there is a continuous frieze enriched by circular pictures in mosaic, being portraits of the popes from St. Peter onward, each 5 feet in diameter. Between the win-

dows in the upper part of the nave are large modern pictures representing scenes from the life of St. Paul.

The Vatican, adjoining St. Peter's, comprises the old and new palace of the popes (the latter now the ordinary papal residence), the sistine chapel, the Loggie and Stanze, containing some of the most important works of Raphael, the picture-gallery, the museums (Pio-Clementino, Chiaramonti, Etruscan and Egyptian), and the library (220,000 vols. and over 25,000 MSS.). The palace on the Quirinal was formerly a favorite summer residence of the popes, but is now occupied by the King of Italy. Among the other palaces are the Palazzo della Cancelleria, the Senatorial Palace in which the senate holds its meetings, the Palazzo Barberini, Borghese, Colonna, Corsini Farnese, etc., etc.

Associations and institutions connected with art, science, or learning are numerous; one of them, the Accademia de' Lincei, founded in 1603 by Galileo and his contemporaries, is the earliest scientific society of Italy. Besides the Vatican library mentioned above, the chief are the Vittorio Emanuele, 500,000 vols.; Biblioteca Casanatense, 200,000 vols.; the Biblioteca Angelica, 150,000 vols.; the Biblioteca Barberini, 100,000 vols., and over 10,000 MSS., etc. For elementary education much has been done since the papal rule came to an end. Hospitals and other charitable foundations are numerous. The principal hospital, called Spirito Santo, a richly-endowed institution situated on the right bank of the Tiber, combines a founding hospital (with accommodation for 3000), a lunatic asylum (accommodation for 500), an ordinary infirmary (accommodation for 1000), and a refuge for girls and aged and infirm persons. The chief theaters are the Teatro Apollo, Teatro Argentina, Teatro Valle, the Capranica, Metastasio, Rossini, Costanzi, etc.

The external trade is unimportant, and is carried on chiefly by rail, the Tiber being navigated only by small craft. There are railway lines connecting with the general system of Italy; and steamers run from Civita Vecchia and Fiumicino to Naples, Leghorn, Genoa, etc. For local passenger traffic there are now horse and electric tramways. A ship canal is projected to connect the city with the sea. The chief manufactures are woolen and silk goods, artificial flowers, earthenware, jewelry, musical strings, mosaics, casts, and various objects of art. The trade is chiefly in these articles, and in olive-oil, pictures, and antiquities. Pop. 490,620.

ROME, a city in Oneida co., New York, on the Mohawk river, 109 miles w.n.w. of Albany; has considerable manufactures of machinery, iron, and builders' wood-work, and a large trade in dairy produce. Pop. 15,343.

ROMULUS was the mythical founder and first king of Rome. His mother was the Vestal virgin, Sylvia or Ilia, a daughter of Numitor, king of Alba. By the god Mars she became the mother of the twins Romulus and Remus, who were ordered by Amulius, the usurping brother of Numitor, to be thrown into

the Anio. The basket containing the two boys was stranded beneath a fig-tree at the foot of the Palatine Hill, and they were suckled by a she-wolf and fed by a woodpecker, until they were accidentally found by Faustulus, the king's herdsman, who took them home and educated them. When they had grown up they organized a band of enterprising comrades, by whose help they deposed Amulius and reinstated Numitor on his throne. They next resolved to found a city, but as they disagreed as to the best site for it, they resolved to consult the omens. The decision was in favor of Romulus, who immediately began to raise the walls. This is said to have happened in the year 753 (according to others 752 or 751) B.C. Remus, who resented his defeat, leaped over the rude rampart in scorn, whereupon Romulus slew him. Romulus soon attracted a considerable number of men to his new city by making it a place of refuge for every outlaw or broken man, but women were still wanting. He therefore invited the Sabines with their wives and daughters to a religious festival, and in the midst of the festivities he and his followers suddenly attacked the unarmed guests, and carried off the women to the new city. This led to a war, which was, however, ended at the entreaties of the Sabine wives, and the two states coalesced. Romulus is said finally to have miraculously disappeared in a thunderstorm (B.C. 716).

RONDO (Italian), or **RONDEAU** (French), a poem of thirteen lines, usually octosyllabic, written throughout on two rhymes and arranged in three unequal stanzas; while the two or three first words are repeated as a refrain after the eighth and thirteenth lines. The term is also applied to a musical composition, vocal or instrumental, generally consisting of three strains, the first of which closes in the original key, while each of the others is so constructed in point of modulation as to reconduct the ear in an easy and natural manner to the first strain.

ROOD, a measure of surface, the fourth part of an acre, equal to 40 square poles or perches, or to 1210 square yards.

ROOF, the cover of any building, irrespective of the materials of which it is composed. Roofs are distinguished, 1st,



Shed Roof

Gable Roof

by the materials of which they are mainly formed, as stone, wood, slate, tile, thatch, iron, etc.; 2d, by their form



Hip roof. Conical roof. Ogee roof.

and mode of construction as shed, curb, hip, gable, pavilion, ogee, and flat roofs. The span of a roof is the width between the supports; the rise is the height in the center above the level of the supports;

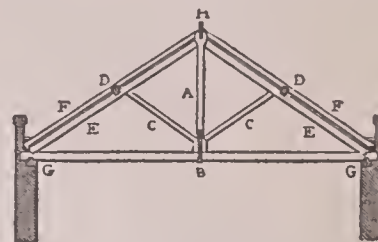
the pitch is the slope or angle at which it is inclined. In carpentry roof signifies the timber framework by which the roofing materials of the building are



Curb roof.

M-roof.

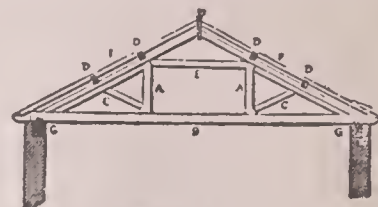
supported. This consists in general of the principal rafters, the purlins, and the common rafters. The principal rafters, or principals, are set across the



King-post roof.

a, King-post. *cc*, Struts or braces. *ee*, Backs or principal rafters. *gg*, Wall-plates. *b*, Tie-beam. *dd*, Purlins. *ff*, Common rafters. *h*, Ridge-piece.

building at about 10 or 12 feet apart; the purlins lie horizontally upon these, and sustain the common rafters, which carry the covering of the roof. Some-



Queen-post roof.

aa, Queen-posts. *cc*, Struts or braces. *e*, Straining-beam. *gg*, Wall-plates. *b*, Tie-beam. *dd*, Purlins. *ff*, Common rafters. *h*, Ridge-piece.

times, when the width of the building is not great, common rafters are used alone to support the roof.

ROOK, a bird of the crow family, differing from the crow in not feeding upon carrion, but on insects and grain. It is also specially distinguished by its gregarious habits, and by the fact that the base of the bill is naked, as well as the forehead and upper part of the throat. In Britain and Central Europe the rook is a permanent resident; but in the north and south it is migratory in habits.

ROOSEVELT, Theodore, the twenty-sixth president of the United States, was born in New York City in 1858. He was elected to the New York assembly in 1881, and allied himself with the republican minority. He was a delegate to the republican national convention of 1884. In 1886 he was the republican candidate for mayor of New York City. From 1889 to 1895 he was a member of the United States civil service commission, being appointed by President Harrison and retained by President Cleveland. In 1895 he became president of the police board in New York City and served for two years. President McKinley in 1897 appointed him assistant secretary of the navy, and his work was of value in hurrying the navy to readiness for the

war with Spain. He resigned from the department in April, 1898, and was active in organizing the First United States Volunteer Cavalry, popularly known as "Roosevelt's Rough Riders." He was first lieutenant-colonel and afterward colonel, being promoted for gallantry in the action at Las Guasimas, Cuba.

He was elected in 1898 governor of New York. He was nominated for vice-president in 1900, and was elected in November of the same year. On September 14, 1901, at the death of McKinley, Roosevelt became his successor. He was nominated in 1904 for the presi-



Theodore Roosevelt

dency and was elected over Parker, his democratic opponent, by a plurality of 2,549,331, and a majority over all of 1,761,998. The vote in the electoral college was Roosevelt 336, Parker 140. This was the largest popular majority ever given a presidential candidate. Upon his election Roosevelt declared he would not accept a renomination and held to that determination despite the pressure upon him by his friends. His administration was marked by the real beginning of the Panama canal, his vigorous opposition to trusts and his attempts to reconcile capital and labor. Upon his retirement in 1909, he left for a hunting trip in Africa.

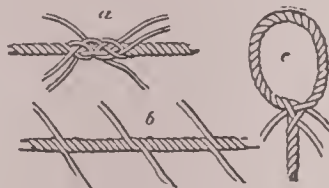
Mr. Roosevelt is the author of the following works: The Naval War of 1812, Life of Thomas Hart Benton and Life of Gouverneur Morris, Ranch Life and Hunting Trail, History of New York City, The Winning of the West, 4 vols.; Essays on Practical Politics, The Wilderness Hunter, American Political Ideals, The Rough Riders, Life of Oliver Cromwell, The Strenuous Life.

ROOT, Elihu, an American lawyer, was born at Clinton, N. Y., in 1845. He began to practice law in 1867, was especially successful as a corporation lawyer, and was counsel for the sugar trust, for New York street railways, and for various railroad companies. From 1883 to 1885 he was United States district attorney in New York City. In 1899 he was appointed secretary of war to succeed Russell A. Alger. He continued in office during McKinley's second administration and under President Roosevelt until the summer of 1903, when he resigned and was succeeded by William H. Taft. He was a member of the Alaskan boundary dispute in 1903, and in 1905 was ap-

pointed by President Roosevelt secretary of state.

ROOT, George Frederick, musician, was born in Sheffield, Mass., August 30, 1820. He was self-taught in the art, and in his eighteenth year he went to Boston to become a teacher of music. In 1844 he removed to New York; he taught there for a while, and in 1850 he went to Paris to study. In 1859 he became a member of the Chicago music house of Root and Cady. Many of his songs have achieved great popularity particularly his war songs, among which are Battle Cry of Freedom, Tramp, Tramp, Tramp, Just Before the Battle, Mother. He died in 1905.

ROPE, a general name applied to cordage over 1 inch in circumference. Ropes are usually made of hemp, flax, cotton, coir, or other vegetable fiber, or of iron, steel, or other metallic wire. A hempen rope is composed of a certain number of yarns or threads which are first spun or twisted into strands, and the finished rope goes under special names according to the number and arrangement of the strands of which it is composed. A hawser-laid rope is composed of three strands twisted left-hand, the yarn being laid up right-hand. A cable-laid rope consists of three strands of hawser-laid rope twisted right-hand; it is called also water-laid, or right-hand rope. A shroud-laid rope consists of a central strand slightly twisted, and three strands twisted around it, and is thus called also four-strand rope. A flat rope



Splices of ropes.

a, Short splice. b, Long splice. c, Eye splice.

usually consists of a series of hawser-laid ropes placed side by side and fastened together by sewing in a zigzag direction. Wire ropes are made of a certain number of wires twisted into the requisite number of strands, and are now extensively used in the rigging of ships as well as for cables. For greater flexibility hempen cores are used; thus for instance we may have a rope of six strands around a hempen core, each strand consisting of six wires around a smaller hempen core. Steel-wire makes a considerably stronger rope than iron wire. Coir ropes are much used on board ships, as, though not so strong as hemp, they are not injured by the salt water.

RORQUAL, the name given to certain whales, closely allied to the common



Rorqual.

or whalebone whales, but distinguished by having a dorsal fin, with the throat

and under parts wrinkled with deep longitudinal folds, which are supposed to be susceptible of great dilatation, but the use of which is as yet unknown. Two or three species are known, but they are rather avoided on account of their ferocity, the shortness and coarseness of their baleen or whalebone, and the small quantity of oil they produce. The northern rorqual attains a great size, being found from 80 to over 100 feet in length, and is thus the largest living animal known. The rorqual feeds on cod, herring, pilchards, and other fish, in pursuing which it is not seldom stranded on the British shores.

ROSA'CEÆ, a large and important order of plants, of which the rose is the type, distinguished by having several petals, distinct, perigynous, separate carpels, numerous stamens, alternate leaves, and an exogenous mode of growth. The species, including herbs, shrubs, and trees, are for the most part inhabitants of the cooler parts of the world. Scarcely any are annuals. The apple, pear, plum, cherry, peach, almond, nectarine, apricot, strawberry, raspberry, and similar fruits, are the produce of the order. Some of the species are also important as medicinal plants.

ROSA'RIO, a town of the Argentine Republic, in the province of Santa Fé, on the right bank of the Paraná, 170 miles northwest of Buenos Ayres. Pop. 93,584.

RO'SARY, among Roman Catholics the recitation of the Ave Maria and the Lord's Prayer a certain number of times. The name is also commonly given to the string of beads by means of which the prayers are counted. The complete or Dominican rosary consists of 150 small beads for the Aves, divided into groups of 10 by 15 large beads for the Pater-nosters. The ordinary rosary has only 50 small beads and 5 large beads; but if repeated thrice makes up the full rosary. A doxology is said after every tenth Ave. The use of rosaries was probably introduced by the Crusaders from the East, for both Mohammedans and Buddhists make use of strings of beads while repeating their prayers; but St. Dominic is usually regarded as the inventor in the Roman church.

ROSCOM'MON, an inland county of Ireland, in the east of the province of Connaught, has an area of 607,691 acres, of which 480,813 are productive. The chief towns are Roscommon, Boyle, and Castlereagh. The county sends two members to parliament. Pop. 101,639.

ROSE, the beautiful and fragrant flower which has given name to the largest natural order Rosaceæ, seems to be confined to the cooler parts of the northern hemisphere. The species are numerous, and are extremely difficult to distinguish. They are prickly shrubs, with pinnate leaves, provided with stipules at their base; the flowers are very large and showy; the calyx contracts toward the top, where it divides into five lanceolate segments; the corolla has five petals, and the stamens are numerous; the seeds are numerous, covered with a sort of down, and are attached to the interior of the tube of the calyx, which, after flowering, takes the form of a fleshy globular or ovoid

berry. The rose is easily cultivated and its varieties are almost endless.

ROSEBERRY, Archibald Philip Primrose, Earl of, born in 1847, was educated at Eton and Oxford, and succeeded his grandfather in 1868. In 1892-94 he was secretary for foreign affairs under Mr. Gladstone, and in 1894-95 he was himself Prime Minister. He has advocated the reform of the House of Lords, and is much interested in the questions of imperial federation and the social condition of the masses. In 1878 he married Hannah, daughter of Baron Mayer de Rothschild, but lost his wife in 1890. He is author of works on Pitt and on Napoleon.

ROSECRANS (rō'ze-krānz), William Starke, American general, was born at Kingston, Ohio, in 1819. He graduated at West Point in 1842. In June, 1861, he was appointed colonel of the twenty-third Ohio. He took part in General McClellan's West Virginia campaign and won the battle of Rich mountain. Shortly afterward he was put in command of the federal forces in western Virginia. In 1862 he commanded the right wing of the army of the Mississippi in the advance on Corinth, fought the battle of Iuka, and successfully defended Corinth against Generals Van Dorn and Price, and relieved General Buell as commander of the army of the Cumberland. He defeated General Bragg in the



W. S. Rosecrans.

battle of Murfreesboro, or Stoneriver. In 1864 he moved into East Tennessee, and was defeated by Bragg in the battle of Chickamauga. Rosecrans was succeeded by Thomas, and after a short period of service in charge of the department of Missouri he was relieved of all command. At the close of the war he resigned from the army; in 1868 he served as minister to Mexico. He was elected to congress in 1880 and again in 1882, as a democrat. From 1885 to 1893 he was register of the United States treasury. In 1889 congress passed an act restoring him to the rank and pay of a brigadier-general. He died in 1898.

ROSE-CHAFER, or **ROSE-BEETLE**, a beetle which frequents roses, feeding on the honey they contain. The rose-chaffer or rose-bug of the United States is destructive to roses and other plants.

ROSEMARY, a shrubby aromatic plant, a native of S. Europe. It has but two stamens; the leaves dark green, with a white under surface; the flowers are pale blue. At one time of considerable repute for medicinal purposes, rosemary is now esteemed chiefly for yielding, by distillation, the aromatic perfume known as oil of rosemary.

ROSE OF JERICHO, a small cruciferous plant, growing in the arid wastes of Arabia and Palestine. When full

grown and ripe its leaves drop and it becomes rolled up like a ball in the dry season, but opens its branches and seed-vessels when it comes in contact with



Rose of Jericho.

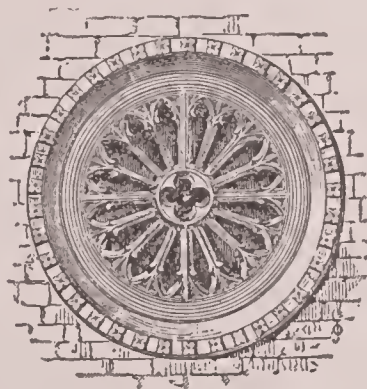
1. The plant. 2. The plant in a dry state. 3. The same expanded after being put in water.

moisture. The generic name has been applied to it from this circumstance, and in Greek signifies resurrection.

ROSES, Wars of the, the fierce struggle for the crown of England between the Lancastrians (who chose the red rose as their emblem) and the Yorkists (who chose the white); it lasted with short intervals of peace for thirty years (1455-85), beginning with the battle of St. Albans and ending with Bosworth Field.

ROSETTA-STONE, a tablet of black basalt, bearing an inscription in three versions (hieroglyphic, enchorial, and Greek) in honor of Ptolemy Epiphanes and belonging to about 196 B.C. It furnished the key for the deciphering of the hieroglyphic inscriptions. The stone, discovered by the French near Rosetta in 1799, is now in the British museum. See Hieroglyphics.

ROSE-WINDOW, a circular window, divided into compartments by mullions and tracery radiating from a center, also called Catharine-wheel, and marigold-window, according to modifications of the design. It forms a fine feature in the church architecture of the 13th and 14th



Rose-window, St. David's.

centuries, and is mostly employed in the triangular spaces of gables. In France it is much used, and, notwithstanding difficulties of construction, attained great size. Some examples, as that at Rheims cathedral, are over 40 feet in diameter.

ROSEWOOD, a wood so named because some kinds of it when freshly cut have a faint smell of roses. Most rosewood comes from Brazil, but it is also found in Honduras and Jamaica. The

name is sometimes given to timber from other sources; but the French Bois de Rose (the German Rosenholz) is called tulip-wood in English.

ROSICRUCIANS, members of a secret society, the first account of which was published early in the 17th century in two books now generally ascribed to J. V. Andreae, a Lutheran clergyman of Württemberg. Many regard Andreae's writings as merely a veiled satire on his own times, and deny altogether the actual existence of any such society, in spite of the fact that since his day many persons (e.g. Cagliostro) have professed to belong to it. The aim of the Rosicrucians, or Brothers of the Rosy Cross, was said to be the improvement of humanity by the discovery of the "true philosophy," and they claimed a deep knowledge of the mysteries of nature, such as the permutation of metals, the prolongation of life, the existence of spirits, etc. According to Andreae the society was founded in the 14th century by a German baron named Rosenkreuz (i.e. "rosy cross"), who was deeply versed in the mysterious lore of the East, and who assembled the initiated in a house called the Sancti Spiritus Domus. The "secret" of the order, if it ever existed, has been faithfully guarded by its members; and the general cloud of mystery shrouding its history and objects has led to its being connected in public opinion with the Cabalists, Illuminati, etc. Some regard Rosicrucianism as the origin of freemasonry.

ROSIN, the name given to the resin of coniferous trees employed in a solid state for ordinary purposes. It is obtained from turpentine by distillation. In the process the oil of the turpentine comes over and the rosin remains behind. There are several varieties of rosin, varying in color from the palest amber to nearly black, and from translucent to opaque. It differs somewhat according to the turpentine from which it is derived, this being obtained from numerous species of pine and fir. Rosin is a brittle solid, almost flavorless, and having a characteristic odor. It is used in the manufacture of sealing-wax, varnish, cement, soap, for soldering, in plaisters, etc. Colophony is a name for the common varieties.

ROSS, Alexander, born in Nairnshire, Scotland, 1783; died at Red River settlement (Winnipeg), 1856. He went to Canada in 1805; joined Astor's expedition to Oregon in 1810, and was afterward a fur-trader in the Hudson's bay service. He is the author of *Adventures of the First Settlers on the Oregon, Fur Hunters of the Far West*, and the *Red River Settlement*.

ROSS, Edward Alsworth, American economist and sociologist, born in 1866 in Virden, Ill. He was professor at Leland Stanford university from 1893 to 1900, first of economics and then of sociology. He resigned in 1900 under pressure and this action aroused considerable excitement over the right of academic free speech. Afterward he was appointed professor of sociology in the University of Nebraska. His publications include: *Sinking Funds*, *Honest Dollars*, a free-silver pamphlet, and

Social Control, a Survey of the Foundation of Order.

ROSS, Sir James Clark, Arctic and Antarctic explorer, was born in London in 1800; died in 1862. He commanded the expedition in the Erebus and Terror to the Antarctic ocean in 1839-43 and on his return published a narrative of that voyage, which has contributed largely to geographical and scientific knowledge generally. Captain Ross was knighted for his services, and received numerous other honors. In 1848 he made a voyage in the *Enterprise* to Baffin's bay in search of Sir John Franklin.

ROSS, Sir John, Arctic navigator, born in 1777, died in 1856, was the fourth son of the Rev. Andrew Ross, minister of Inch, Wigtownshire. His main expedition, in the steamer *Victory*, was equipped by Sir Felix Booth, and set out in May, 1829. Ross entered Prince Regent's Inlet, and discovered and named Boothia Felix and King William's Land. In 1832 he was forced to abandon his ships, and he and his crew suffered great hardships before they were picked up in August, 1833, by his old ship the *Isabella*. In 1834 Captain Ross was knighted, and in the following year published a narrative of his second voyage. In 1850 he made a last Arctic voyage in the *Felix*, in a vain endeavor to ascertain the fate of Sir John Franklin. He became a rear-admiral in 1851.

ROSS AND CROMARTY, formerly two separate counties of Scotland, now united into one. The latter consisted merely of detached portions scattered over the former. The county extends across the breadth of Scotland from the North sea to the Atlantic, between the counties of Inverness and Sutherland, and includes the island of Lewis and other islands. Area of the whole, 2,003,065 acres, of which 220,586 belong to Cromarty. Principal towns: Dingwall (the county town), Stornoway, Cromarty, Invergordon, Tain, and Fortrose. Pop. 76,149.

ROSSE, William Parsons, third earl of, was born at York in 1800, died 1867. In 1827 he constructed a telescope, the speculum of which had a diameter of 3 feet, and the success and scientific value of this instrument induced him to attempt to cast a speculum twice as large. After innumerable difficulties, for every step had to be pioneered by experiment, and after many failures, Lord Rosse succeeded in 1845 in perfecting machinery which turned out the huge speculum, weighing 3 tons, without warp or flaw. It was then mounted in his park at Parsonstown, on a telescope 54 feet in length with a tube 7 feet in diameter. A series of cranks, swivels, and pulleys enables this huge instrument to be handled almost with as much ease as telescopes of ordinary size. The sphere of observation was immensely widened by Lord Rosse's instrument, which has been chiefly used in observations of nebulae.

ROSSETTI, Gabriel Charles Dante, better known as Dante Gabriel, painter and poet, was born in London in 1828, and died in 1882. In 1849 he exhibited his painting of the *Girlhood of Mary*, Virgin; but his later works, numerous

as they were, were rarely seen by the public until the posthumous exhibition of a collection of his paintings in 1883 at the Royal Academy. Rossetti is even more famous as a poet; and his poems are characterized by the same vivid imagination, mystic beauty, and sensuous coloring as his paintings. In both arts he appears as a devotee of mediævalism. His chief poems are the *House of Life*, a poem in 101 sonnets; the *King's Tragedy* and other Ballads, Dante at Verona, Blessed Damozel, etc. His wife died in 1862, two years after marriage, and from this grief he never entirely recovered.—His sister, Christina Georgina (b. 1830, d. 1894), was a poetess of high merit. Her chief works are: *Goblin Market* and other Poems (1862), *The Prince's Progress* and other Poems (1866), *The Pageant* and other Poems (1881), besides prose stories, books for children, and several devotional works in prose and poetry.

ROSSINI, Gioachino Antonio, Italian operatic composer, was born at Pesaro, February 29, 1792; died November 13, 1868. He is specially considered to be a master of melody. His finest opera is *William Tell* (1829). Other chief works are: *Othello* (1816), *Moses in Egypt* (1818), and *Semiramide* (1823); and the comic operas, the *Barber of Seville* (1816) and *La Cenerentola* (1817). He also composed a *Stabat Mater* (1842), a *Missa Solennis* (first performed 1869), and various cantatas, oratorios, and pianoforte pieces.

ROSTAND (rō'stān'), Edmond, French dramatist, was born in Marseilles in 1868. His first drama *Les Romanesques* was a success and was followed by *La Princesse Lointaine* and *La Samaritaine*. In 1897 his *Cyrano de Bergerac* was a success on two continents and in 1900 his historical drama *L'Aiglon* having for its central figure the unhappy Duke of Reichstadt "Napoleon II" added greatly to his reputation. Rostand was elected a member of the French academy in 1901.

ROSTOV, or **ROSTOF**, a town of Southern Russia, in the province of the Don Cossacks, on the Don, about 20 miles above its mouth in the Sea of Azof. Pop. 150,000.

ROT, a disease incident to sheep (sometimes to other animals), and caused by the presence in the gall-bladder and biliary ducts of the common liver-fluke, developed from germs swallowed by the sheep with their food. The average length of the mature fluke is about 1 inch. Within the liver of a single sheep several dozen of these parasites may sometimes be found. The disease is promoted by a humid state of atmosphere, soil, or herbage. It has different degrees of rapidity, but is almost invariably fatal.

ROTATION, in physics, is the motion of a body about an axis, so that every point in the body describes a circular orbit, the center of which lies in the axis. It is thus distinguished from revolution, or the progressive motion of a body revolving round another body or external point. If a point, which is not the center of gravity, be taken in a solid body, all the axes which pass through that point will have different moments of

inertia, and there must exist one in which the moment is a maximum, and another in which it is a minimum. Those are called the principal axes of rotation. When a solid body revolves round an axis its different particles move with a velocity proportional to their respective distances from the axis, and the velocity of the particle whose distance from the axis is unity is the angular velocity of rotation.

ROTATION OF CROPS, in agriculture and horticulture, is the system or practice of growing a recurring series of different annual crops upon the same piece of land. The system is based on the fact that different crops absorb different quantities of the various inorganic constituents of the soil, thus impoverishing it for crops of the same kind, but leaving it unimpaired, or even improved, for crops feeding upon other constituents. Different soils and climates require different schemes of rotation, but it is a tolerably universal rule that culmiferous or seed crops should alternate with pulse, roots, herbage, or fallow. The rotation of crops may be arranged in "courses" or "shifts" of any number of successive crops; 3, 4, or 5, years' courses are perhaps the commonest.

ROTHERHAM, a municipal borough of England, in the West Riding of Yorkshire, 5 miles northeast of Sheffield, on the Don, at its junction with the Rother. The fine Perpendicular church dates from the time of Edward IV.; the grammar-school from 1483. Rotherham has an Independent college, and extensive iron-works and manufactures of iron goods, soap, glass, etc. Pop. 54,348. It gives name to a parliamentary division.

ROTHSCHILD (rōt'shilt; in English generally pronounced roths'child or roschild), the name of a family of Jewish bankers, distinguished for their wealth and influence. The founder of the original banking-house was Mayer Anselm Bauer (1743-1812), a poor orphan, born in Frankfort-am-Main. Though educated as a teacher, Bauer entered a bank in Hanover, and finally saved sufficient capital to found a business of his own in the famous Judengasse of Frankfort, at the sign of the Red Scutcheon (Roth Schild), which afterward gave name to the family. He gained the friendship of the Landgrave of Hesse, who appointed him his agent, and in 1802 he undertook his first government loan, raising ten million thalers for Denmark. At his death in 1812 he left five sons, the eldest of whom, Anselm Mayer von Rothschild (1773-1885), became head of the firm in Frankfort, while the others established branches at various foreign capitals; Solomon Mayer (1774-1855) at Vienna, Nathan Mayer (1777-1836) in London, Karl Mayer (1788-1855) at Naples, and Jacob (1792-1868) at Paris. These branches, though in a measure separate firms, still conduct their operations in common; and no operation of magnitude is undertaken by any without a general deliberation of all at Frankfort. The Naples branch was discontinued in 1860; the two sons of Karl Mayer (Mayer Karl, 1820-86, and Wilhelm Karl) succeeding their childless uncle Anselm at Frankfort. The bold,

yet skilful and cautious operations of the Rothschilds during the troubled political years after 1813 confirmed the fortunes of the firm. Nathan Mayer in particular distinguished himself by his energy and resource. By means of special couriers, carrier-pigeons, swift sailing-boats, etc., he was frequently in possession of valuable information (e.g. the result of the battle of Waterloo) even before the government, and skilfully turned his advantage to account. The Rothschilds do not condemn comparatively small operations; but they are chiefly famous for the enormous loans which they raise and manage for different European governments. In 1822 the five brothers were made barons by Austria; and in 1885 Baron Nathan von Rothschild (1840-1905) was raised to the English peerage. Lionel Nathan (1808-79), the father of the last-named, was the first Jew who sat in parliament (1858); and various other members of the family have risen to positions of honor and dignity both in Britain and other countries. Baron Alphonse, the head of the firm of Rothschild, governor of the bank of France, died in Paris in 1905.

ROTTERDAM, the chief port and second city in Holland, is situated on the



Nieuwe Maas or Meuse, at its junction with the Rotte, about 14 miles from the

and not interrupted by a single lock. The town is intersected by numerous canals, which permit large vessels to moor alongside the warehouses in the very center of the city. These canals, which are crossed by innumerable draw-bridges and swing-bridges, are in many cases lined with rows of trees; and the handsome quay on the river front, 1½ miles long, is known as the Boompjes ("little trees"), from a row of elms planted in 1615 and now of great size. Many of the houses are quaint edifices, having their gables to the street, with overhanging upper stories. The principal buildings are the town-hall, court-houses, exchange, old East India House, Boymans' museum, containing chiefly Dutch and modern paintings, and the government dockyards and arsenal, besides the numerous churches, of which the most conspicuous is the Groote Kerk, or church of St. Lawrence (15th century). The Groote Markt has a statue of Erasmus, a native of the town; and there are fine parks and a large zoological garden. Rotterdam contains ship-building yards, sugar-refineries, distilleries, tobacco-factories and large machine works; but its mainstay is commerce. It carries on a very extensive trade with Great Britain, the Dutch East and West Indies, and other trans-oceanic countries, and has an important commerce with Germany, Switzerland, and Central Europe. The Maas is crossed by a great railway-bridge and another for carriages and foot-passengers. Pop. 340,000.

ROUBAIX (rō-bā), a town of France, department Nord, 6 miles n.e. of Lille, is a highly important seat of the French textile industry. Woolens, cottons, and silk or mixed stuffs are chiefly made; also beet-sugar, machinery, etc. Pop. 124,977.

ROUBLE, a silver coin, the standard of money in Russia, with a legal weight (since January 1, 1886) of 19.99 grammes equal to about 76 cents. A rouble is

there is little but paper-money, current at about 30 per cent below its nominal value. The gold imperial is worth 10 roubles, the half-imperial 5 roubles.

ROUEN (rō-ān), the old capital of Normandy, now chief town of department Seine-Inférieure, in France, is situated on the Seine, 80 miles from the sea and 87 miles n.n.w. of Paris. It is the seat of an archbishop, and the fourth port in France. In its older parts the streets are narrow, picturesque, and ill-built, but interesting to the lover of mediæval architecture. The cathedral, erected in the 13th-15th centuries, is one of the finest Gothic monuments in Normandy, though it is surpassed in beauty by the exquisite church of St. Ouen, begun in 1318 and finished at the close of the 15th century. St. Maclou (15th century) is a fine example of florid Gothic. Among the secular buildings are the Palais de Justice (late 15th century), exuberant in decoration; the Hotel de Ville, formerly a part of the monastery of St. Ouen; the Hotel de Bourgtheroulde (15th century), with fine reliefs; the archbishop's palace; and the distinctive Tour de la Grosse-Horloge (1389). The new Musée, built in 1888, contains a large collection of paintings, chiefly of the French school. The municipal library has 120,000 volumes and 2500 MSS. Pop. 115,914; or including the faubourgs, 160,000.

ROUGE (rōzh), a very fine scarlet powder, used by jewelers for polishing purposes, and prepared from crystals of sulphate of iron exposed to a high temperature. The name is also given to a cosmetic prepared from safflower.

ROUGE-ET-NOIR (rōzh-ē-nwār; Fr. "red and black"), Trente-Un (trānt-un; "thirty-one"), or Trente et Quarante (trānt-ē-kā-rānt; "thirty and forty"), a modern game of chance played with the cards belonging to six complete packs. The punters or players stake upon any of the four chances: rouge, noir, couleur, and inverse. The banker then deals a row of cards for noir, until the exposed pips number between 30 and 40 (court-cards count 10, aces 1), and a similar row for rouge. That row wins which most nearly approaches the number 31, and players staking on the winning color receive their stake doubled. Couleur wins if the first card turned up in the deal is of the winning color; in the contrary case inverse wins. When the number of pips in both rows are equal it is a refait, and a fresh deal is made; but if both happen to count exactly 31 it is a refait de trente-et-un, and the banker claims one-half of all stakes. This last condition places the banker at an advantage calculated to be equal to about 1½ per cent on all sums staked.

ROUGET DE LISLE. See Marseillaise Hymn.

ROULETTE (rō-let'; Fr. "little wheel"), a game of chance, in which a small ivory ball is thrown off by a revolving disc into one of 37 or 38 compartments surrounding it, and numbered from 1 to 36, with one or two zeros. Players who have staked upon the number of the compartment into which the ball falls receive thirty-six times their stake; less if they have staked upon more than one number.



Church of St. Laurens, Rotterdam.—After Sir A. W. Calcott, R. A.

North sea, with which it is also directly connected by a ship canal (Nieuwe Waterweg) admitting the largest vessels divided into 100 copecks. Half and quarter roubles and smaller silver coins are also issued; but in actual circulation

There are also other chances on which stakes may be placed.

ROUMA'NIA, a European kingdom, bounded by Austria-Hungary, Servia, Bulgaria, the Black sea, and Russia; area, 50,760 sq. miles. It includes the former Danubian principalities of Walachia and Moldavia and the province of the Dobrudsha on the Black sea. Pop. 5,912,520. The capital is Bukarest; other chief towns are Jassy, Galatz, Braila, and Giurgevo. The chief cereal crops are corn, wheat, barley, rye, and oats; tobacco, hemp, and flax are also grown; and wine is produced on the hills at the foot of the Carpathians. Cattle, sheep, and horses are reared in large numbers. Excellent timber abounds on the Carpathians. Bears, wolves, wild boars, large and small game, and fish are plentiful. The country is rich in minerals of nearly every description, but salt, petroleum, and lignite are the only minerals worked. Manufactures are still in a rudimentary state.

The Roumanians, who call themselves Romani, claim to be descendants



Roumanian peasants.

of Roman colonists introduced by Trajan; but the traces of Latin descent are in great part due to a later immigration, about the 12th century, from the Alpine districts. Their language and history both indicate that they are a mixed race with many constituents. Their language, however, must be classed as one of the Romance tongues, though it contains a large admixture of foreign elements. In Roumania there are about 4,500,000 Roumanians, 400,000 Jews, 200,000 gypsies, 100,000 Bulgars, 50,000 Magyars, 50,000 Germans, 15,000 Greeks, and 15,000 Armenians. Three-fourths of the population are peasants, who until 1864 were kept in virtual serfdom by the boiars or nobles. In that year upward of 400,000 peasant families were made proprietors of small holdings averaging 10 acres, at a price to be paid back to the state in fifteen years. About 4½ millions of the people belong to the Greek church. Energetic efforts

are being made to raise education from its present low level. Roumania has two universities (at Bukarest and Jassy), several gymnasia, and a system of free primary schools, at which attendance is compulsory. Roumania is a hereditary constitutional monarchy, with a bicameral legislature.

ROUNDERS, a game played with a bat and a ball by two parties or sides, on a piece of ground marked off into a square or circle, with a batter's station and three goals all at equal distances. On the ball being thrown toward him the batter tries to drive it away as far as he can and run completely round the goals, or over any one of the four parts, before the ball can be thrown back to the batting station. The batter is declared out if he fails to secure a run after having had three balls, if a fielder returns the ball so as to strike him while running, or if the ball from his bat is caught in the air by one of the fielders. The modern game of base ball has been evolved and developed from Rounders.

ROUND-FISH, a fish of the salmon family, found in many of the lakes and rivers of the northern United States and Canada. When in good condition it is very fat and of exquisite flavor, weighing about 2 lbs.

ROUNDHEADS, a name formerly given by the Cavaliers or adherents of Charles I., during the English civil war, to members of the Puritan or parliamentary party, who distinguished themselves by having their hair closely cut, while the Cavaliers wore theirs in long ringlets.

ROUND ROBIN, a written protest or remonstrance, signed in a circular form by several persons, so that no name shall be obliged to head the list. This method of bringing grievances to the notice of superiors was first used by French officers, when its derivation from *rond ruban* "round ribbon."

ROUND TABLE, The, famous in the Arthurian legends, a table for the accommodation of a select fraternity of knights said to have been established by Uther Pendragon, father of King Arthur, and when it was complete to have had 150 knights of approved valor and virtue.

ROUND TOWERS, a class of tall nar-



Round tower on Devenish island, Fermanagh.

row circular edifices, tapering somewhat from the base upward, and generally

with a conical top, from 60 to 130 feet in height, and from 20 to 30 in diameter. With the exception of three in Scotland, they are peculiar to Ireland. The doors are from 6 to 20 feet from the ground, the windows small. The interior contained no stairs, but the successive stories were reached, like the doors, by means of ladders. Authorities are now pretty well agreed that these towers were the works of a Christianized race, erected as places of refuge and as watch-towers. They date from the 8th or 9th to the 13th century.

ROUSSEAU, Jean Jacques, one of the most celebrated and most influential writers of the 18th century, was born in 1712, at Geneva. In 1752 he brought out a successful operatta (the music by himself), and soon after a celebrated Letter on French Music. In 1754 he revisited Geneva, where he was readmitted a free citizen on once more embracing Protestantism. Having returned to Paris he wrote a sort of novel, *Julie ou La Nouvelle Héloïse*, which was published



Jean Jacques Rousseau.

in 1760, being followed by *Le Contrat Social*, a political work, and *Emile ou de l'Education*, another story, in 1762. The principles expressed in these works stirred up much animosity against their author. The chief importance of his works lies perhaps in the fact that they contain the germ of the doctrines which were carried out with such ruthless consistency in the French revolution. Rousseau was also a musical author and critic of some importance.

ROUSSILLON (*rō-sē-yōn*), a former province of France, now occupied by the department of the Pyrénées Orientales. It gave name to a family of counts.

ROVI'GO, a town in Italy, 23 miles s.w. of Padua, capital of a province of its name, on the Adigetto, an arm of the Adige. The town-house contains a picture-gallery and a library of 80,000 vols. There is a handsome courthouse and two leaning towers belonging to a castle erected in the 10th century. Pop. 7272. The province has an area of 651 sq. miles; pop. 217,700.

ROWING is the art of propelling a boat by means of oars, which act as levers of the second order, the work being done between the power (i.e., the rower) and the fulcrum (i.e., the water, of which the actual displacement is very slight). That part of the operation during which the power is actually being applied, i.e., when the oar is in the water, is specifically called the stroke; while feathering is the act of turning the blade

of the oar so as to be parallel to the surface of the water, and carrying it thus through the air into position to repeat the stroke. Much skill is required to perform these operations satisfactorily; and in fact rowing can be learned only from observation and practice. Technically the word "rowing" is used by boating-men only when each oarsman has but a single oar; when he has one in each hand he is said to "scull," and the oars are called "sculls." Although rowing is certainly one of the most ancient methods of propelling vessels, it has only comparatively recently come into prominence as a form of sport. Boat-racing practically dates from the first quarter of the 19th century, and its development has lain almost entirely in the hands of the Anglo-Saxon races. In the United States the first amateur rowing-club was founded in 1834, but the sport did not make much progress until the universities of Yale (in 1843) and Harvard (in 1844) took it up, followed by other universities. Yale and Harvard have competed annually since 1878. The chief regatta is held on different courses in different years by the National Association of Amateur Oarsmen, founded in 1873. The use of outriggers was introduced about 1844, that of sliding-seats, an American invention, about 1871.

ROWLAND, (rō'land), Henry Augustus, American physicist, was born at Honesdale, Pa., in 1848. In 1876 he became professor of physics at Johns Hopkins university, a chair which he held until his death. His determination of the mechanical equivalent of heat was one of his most important investigations. His determination of the ohm was likewise of great value and his study of the magnetic properties of iron led to entirely new conceptions of magnetism. He investigated the solar spectrum and the arc spectra of various elements, and carried on many researches in allied fields. His most important discovery was that of the magnetic effect of electric convection, which has a wide-spread theoretical bearing upon electrical phenomena. He was the president of the American Physical society at the time of his death in 1901.

ROWLOCK, a contrivance on a boat's gunwale on which the oar rests in rowing; as, a notch in the gunwale, two short pegs, an iron pin, etc.

ROYAL ARCANUM, The, a fraternal and beneficial society organized at Boston in 1877. The society is governed through councils, which are dominated by the supreme council or governing body. Benefit certificates are issued for \$1500 and \$3000, payable at death of a member. It has an approximate membership of 258,746. The emblem of the society is a royal crown within a circle, on the circumference of which are ten small Maltese crosses with the motto, "Mercy, Virtue, and Charity."

ROYAL SOCIETY (London), The, the oldest learned society out of Italy, was founded for the study and promotion of natural science. It owes its origin to a club of learned men who were in the habit of holding weekly meetings in London as early as 1645, but the year 1660 is generally given as the year of its founda-

tion. Charles II. took much interest in the proceedings of the society, and in 1682 granted a charter to the "President, Council and Fellows of the Royal Society of London for Improving Natural Knowledge." Lord Brouncker was first president of this incorporated Royal society. Meetings are held weekly from November to June for the purpose of reading and discussing scientific papers; and the more important of these are published in the annual *Philosophical Transactions*, first issued in 1665, and now forming a most valuable series. Accounts of the ordinary meetings, with abstracts of papers, etc., appear also in the periodical *Proceedings*, begun in 1800. Scientific research has at all times been both initiated and encouraged by the Royal society, and many of the most important scientific achievements and discoveries have been due to its enlightened methods. It deservedly enjoys an influential and semi-official position as the scientific adviser of the British government, which have borne valuable fruit, from the voyage of Capt. Cook in the *Endeavour* in 1768 down to the Challenger expedition, more than a century later. It awards the Copley, Davy, and two royal medals annually, and the Rumford medal biennially, for distinction in science; the first being the blue riband of scientific achievement, and bestowed both on foreign and British savants. The roll of the Royal society contains practically all the great scientific names of its country since its foundation. Among its presidents have been Samuel Pepys, Sir Isaac Newton, Sir J. Banks, Sir Hans Sloane, Sir Humphry Davy, Prof. Huxley, and Lord Kelvin.

RU'BENS, Peter Paul, the most eminent painter of the Flemish school, was born in 1577 at Siegen in Westphalia, though his childhood was spent chiefly at Cologne. In 1621 he was employed by Marie de' Medici to design for the gallery of the Luxembourg the well-known series of magnificent allegorical pictures illustrating the life of that princess. After the death of his wife in 1626 he was employed by the Archduchess Isabella in endeavoring to arrange a truce between Spain and the Netherlands; in 1628 he was engaged in the important private negotiations of a peace between Spain and England, in the course of which he visited Madrid and England (in 1629). He was knighted by Charles I., and his brush, never idle either in Madrid or London, decorated the ceiling of the banqueting-house at Whitehall. In 1630 he married Helena Fourment, who appears in many of his later works, and settled once more in Antwerp, where he continued to produce numerous pictures until his death in May, 1640. His works are in all branches of his art—history, landscape, portraiture, and genre—and are met with all over Europe. The Descent from the Cross in Antwerp cathedral is generally considered his master-piece. His pictures number upward of 2000, exclusive of about 500 drawings, a few etchings, etc.

RU'BICON, a river in North Italy (now the Fiumicino, a tributary of the Adriatic), famous in Roman history, Cæsar having by crossing this stream

(49 B.C.), at that time regarded as the northern boundary of Italy, finally committed himself to the civil war. Hence the phrase "to pass the Rubicon" is to take the decisive step by which one commits one's self to a hazardous enterprise.

RUBID'IUM, a rare metal discovered by Bunsen and Kirchhoff in 1860, by spectrum analysis; symbol Rb, atomic weight 85.4. It is a white, shining metal, and at ordinary temperatures it is soft as wax. It is usually found in connection with cæsium, and belongs to the group of the alkali metals. See Cæsium.

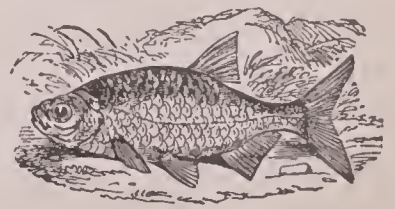
RU'BINSTEIN, Anton Grigoryevitch, a Russian composer and pianist, born in 1829. As a composer he was very prolific being especially happy in his piano-forte pieces. His operas have had but a qualified success. He died in 1894. He had previously published an autobiography.

RUBRIC, in the canon law, signifies a title or article in certain ancient law books, thus called because written in red letters (L. ruber, red). In modern use rubrics denote the rules and directions given at the beginning and in the course of the liturgy for the order and manner in which the several parts of the office are to be performed. Where red ink is not employed now the rubrics are printed in italics, or in some other distinctive character.

RUBY, a precious stone of a deep-red color, of which there are two varieties—the oriental and the spinel. The oriental ruby or true ruby is a corundum formed nearly exclusively of alumina, of great hardness, and the most valuable of all precious stones. A ruby of five carats, if perfect in color, is said to be worth ten times as much as a diamond of the same weight. Oriental rubies are found chiefly in Burmah and Siam; inferior specimens have also occurred in North America and Australia. Spinel rubies consist of an aluminate of magnesium, and are much inferior to the true rubies in hardness and value. They are found in Burmah, Ceylon, and Australia. A lighter-colored variety, discovered in Badakshan, is known as the balas ruby.

RUBY-THROAT, a species of humming-bird, so named from the brilliant ruby-red color of its chin and throat. In summer it is found in all parts of North America, up to 57° n. lat., being thus remarkable for its extensive distribution.

RUDD, a fish of the carp family, having the back of an olive color; the sides and belly yellow, marked with red; the ventral and anal fins and tail of a deep-



Rudd.

red color. It is common in Great Britain and throughout Europe. Its average length is from 9 to 15 inches. Called also Red-eye.

RUDDER-FISH

RUDDER-FISH, a fish allied to the mackerel, very common in the Atlantic and Pacific oceans, so named from its habit of swimming around the sterns of ships, attracted, doubtless, by the refuse thrown overboard. The flesh is said to be coarse in flavor.

RUE, a strong-scented herbaceous plant, native of Southern Europe. The root is perennial, woody; the stems about 2 feet high; the leaves alternate, petiolate, and divided; and the flowers yellow. The odor of rue is strong and penetrating, and the taste acrid and bitter. It has useful medicinal properties. This plant is an ancient emblem of re-



Rue.

membrane from its evergreen quality. The old names "herb-grace" or "herb of grace" refers to this fact, or perhaps to its common use in sprinkling the people with holy water, and as a charm against witchcraft. About 20 species of rue are known.—Oil of rue is obtained by distilling garden rue with water; has a strong disagreeable odor and slightly bitter taste; and is used as an ingredient in aromatic vinegar.

RUFF, a bird belonging to the grallatores or waders, length, 10½ to 12½ inches; plumage, which varies greatly in color, generally variegated brown on back and wings, white on belly. In the breeding season the male has its neck surrounded by long plumes, which, when



Ruff.

raised form a kind of tippet or ruff, whence its English name. The scientific name ("pugnacious fighter") is derived from its pugnacious habits at the same season. The females are called reeves. These birds nest in swamps; the eggs, three or four in number, are pale green blotched with brown.

RUFFED GROUSE, a North American species of grouse of the same genus

as the hazel-grouse of Europe. It is named from the tufts of feathers on the sides of its neck, and frequents forests and thickets.

RULE, BRITANNIA, a British national song, of which the words, almost certainly by James Thomson, form part of the masque of Alfred, by Thomson and David Mallet, which was first performed in 1740. The music was written by Dr. Arne.

RULE OF THREE, The, an application of the doctrine of proportion to arithmetical purposes by which we are enabled to find a fourth proportional to three given numbers, that is, a number to which the third bears the same ratio as the first does to the second. The rule is divided into two cases, simple and compound; now frequently termed simple and compound proportion. Simple proportion is the equality of the ratio of two quantities to that of two other quantities. Compound proportion is the equality of the ratio of two quantities to another ratio, the antecedent and consequent of which are respectively the products of the antecedents and consequents of two or more ratios.

RUM, the liquor obtained by distillation from the skimmings and the molasses formed in the manufacture of cane-sugar. The pure distilled spirit is colorless, and receives its brown tint from the addition of caramel. Rum is obtained chiefly from the West Indies and British Guiana; the best sort is named Jamaica rum, no matter where manufactured. Pine-apple rum is ordinary rum flavored with sliced pine-apples; tafia is an inferior French variety of rum.

RUMINANTS, or **RUMINANTIA**, a group of herbivorous mammals, belonging to the great order of hoofed or ungulate mammals, included in the artiodactyle or "even-toed" section of these, and comprising the five families, camel and llama; chevrotain; true deer; giraffe; and ox, sheep, goat, antelope. The faculty of rumination, though it gives name to this order, is not quite peculiar to it. Ruminants are distinguished from other orders by certain peculiarities of dentition. The most typical of the group, the ox, sheep, antelope, etc., have no incisor or canine teeth in the upper jaw, but have instead a hardened or callous pad against which the six lower incisors bite. In the lower jaw are two canines quite similar to the incisors, and the camelidæ and tragulidæ possess also upper canines. In both jaws are six grinding teeth on either side, separated by an interval from the front teeth. The feet of ruminants are cloven. Horns, developed in pairs, are present in the majority of the species; either solid, as in the antlers of the true deer, or hollow as in the horns of the ox, etc. The alimentary canal is very long. The stomach is divided into four compartments, frequently spoken of as four stomachs. The first and largest (rumen or paunch) receives the food roughly bruised by the first mastication, and transmits it to the second (reticulum or honey-comb), whence it is sent back in pellets to the mouth to be rechewed. This second mastication is called "chewing the cud." The food is then re-swallowed into the

RUNES

third stomach (psalterium, omasum, or manyplies), and passes finally into the true digestive cavity (abomasum). Fluids may pass directly into any part of the stomach. In young ruminants, which feed upon milk, the first three "stomachs" remain undeveloped until the animal begins to take vegetable food. Most of the ruminants are suitable for human food. They are generally gregarious, and are represented by indigenous species in all parts of the world except Australia.

RUMINATION, the faculty possessed by some mammals, notably ruminants (which see), of "chewing the cud"—that is, of returning the food to the mouth from the stomach for remastication prior to final digestion. Some marsupials and certain other mammals probably share this faculty with the ruminants.

RUMP PARLIAMENT, is the name by which the fag-end or remainder of the Long Parliament (1640–60) was known after the expulsion of the majority of its members on December 6, 1648, by Cromwell's soldiers, commanded by Colonel Pride. Only sixty members, all extreme independents, were admitted after this Pride's Purge, as it was called; and they, with the army, brought about the condemnation of Charles I. The Rump was forcibly dissolved by Cromwell in 1653, for opposing the demands of the army. Twice after this it was reinstated, but both times only for a brief period, and finally, on the 16th March, 1660, it decreed its own dissolution.

RUNES, the letters of the alphabets peculiar to the ancient Teutonic peoples of Northwestern Europe, found inscribed on monuments, tomb-stones, clog-calendars, bracteates, rings, weapons, etc., and only rarely and at a late period in MSS. They are formed almost invariably of straight lines, either single or in combination. Three runic alphabets (or "futhorks," as they are sometimes called from the first six letters) have hitherto been usually recognized; the Norse, with sixteen characters, the Anglo-Saxon, with forty, and the Ger-

ᚠ	ᚢ	ᚦ	ᚨ	ᚱ	ᚴ	ᚷ	ᚹ
f	u	th	o	r	k	h	n
ᚐ	ᚓ	ᚖ	ᚗ	ᚘ	ᚙ	᚛	ᝰ
i	a	s	t	b	l	m	y

Norse runic alphabet.

man; but modern researches have traced the common origin of these in an older primary Germanic or Teutonic futhork with twenty-four characters. The name is generally believed to be the same as Anglo-Saxon rûn, a mystery, implying a magical or hieroglyphic character, which doubtless runic writings acquired when the lapse of time had rendered them unintelligible to the common people; and runic wands or staves were smooth willow-wands inscribed with runic characters and used in incantations. The period of origin and the source of runes are not known. Scandinavian and Anglo-Saxon tradition ascribes their invention to Woden. Some have believed that the Scandinavians learned the art of writing from Phœnician merchants trading to the Baltic; Dr. Isaac Taylor recognizes in the Greek alphabet the prototype of

the futhorks; while others find it in the Latin. Runic inscriptions abound in Scandinavia, Denmark, Iceland, and the parts of England once known as Northumbria, Mercia, and East Anglia, but they are also found beyond these limits. Weapons and instruments, inscribed with runes and dating from 300-400 A.D., have been dug up in Norway. The use of runes gradually disappeared under the influence of the early Christian missionaries, who proscribed them on account of their magical reputation; but in England some Christian inscriptions have been found in the runic characters. The latest runic inscriptions in Sweden date about 1450.

RUNJEET SINGH, the "Lion of the Punjab" and founder of the Sikh kingdom, was born in 1780, and died 1839. In 1836 he suffered a heavy defeat from the Afghans, but he retained his power until his death. See Punjab.

RUNNYMEDE, the meadow on the right bank of the Thames, now a racecourse, in Surrey, England, 4 miles below Windsor, where King John met the barons who compelled him to sign Magna Charta, June 15, 1215. The actual signing is said to have taken place on Magna Charta Island opposite Runnymede.

RUPEE, the standard silver coin of British India, the value of which is 48 cents, has, owing to the depreciation of silver, been much lower in recent years. Its value in India is now fixed by law at one-fifteenth of a sovereign, or 32 cents. A rupee equals 16 annas 100,000 rupees are called a lac; 100 lacs, a crore.

RUPERT OF BAVARIA, Prince, distinguished as a cavalry leader in the English civil war, the third son of Frederick V., elector palatine and king of Bohemia, by Elizabeth, daughter of James I. of England, was born in 1619 at Prague. In 1653 he joined Charles II. at Versailles. After the Restoration he was appointed lord-high-admiral, and served with Monk against the Dutch. He became governor of Windsor Castle and died in London in 1682. Many of his latter years were devoted to scientific study, and he is credited with the invention of mezzotint engraving, which at least he introduced into England. He was one of the founders and the first governor of the Hudson's bay company.

RUSH, the common term for a genus of plants, natural order Juncaceæ. The rushes have a glumaceous perianth of six sepals, glabrous filaments, three stigmas, and a three-celled many-seeded capsule. The leaves are rigid, mostly roundish, and smooth. Rushes are found chiefly in moist, boggy situations in the colder climates; about twenty species are noted in the British flora. The leaves are often employed to form matting and the bottoms of chairs, and the pith for the wicks of candles.

RUSH, Benjamin, famous American physician, was born in 1745 near Philadelphia. In 1766 he went to Edinburgh, and took his degree of M.D. there in 1768. He began to practice at Philadelphia in 1769, becoming at the same time lecturer in chemistry at the medical school of that city. He afterward filled the chair of the theory and practice of physic in the University of Pennsyl-

vania. He early identified himself with the patriotic party, was one of the



Benjamin Rush

signers of the declaration of independence, and in 1787 was a member of the convention of Pennsylvania for the adoption of the federal constitution. In 1774 he was one of the founders of the first antislavery society in America. He died in 1813. Dr. Rush was a voluminous and versatile writer. His chief medical works are his Medical Inquiries and Observations, Diseases of the Mind, and Medical Tracts.

RUSH, Richard, statesman, was born in Philadelphia, August 29, 1780, and died there July 30, 1859. He was a graduate of Princeton and was admitted to the bar in 1800. He soon became a prominent advocate, and held several offices of importance. In 1811 he was comptroller of the currency, and in 1814 United States attorney-general. In 1817 he was for a short time secretary of state, and was then appointed minister to England, where he performed some important diplomatic services. In 1825 he was secretary of the treasury, and in 1828 he was candidate for the vice-presidency under Adams. From 1847 to 1851 he was minister to France.

RUSK, Jeremiah McLain, ex-governor of Wisconsin, secretary of agriculture, was born in Morgan co., Ohio, June 17, 1830. In 1862 he was made major of the 25th Wisconsin and served with Sherman till the close of the war, attaining the rank of lieutenant-colonel. In 1865 he was brevetted brigadier-general of volunteers. In 1870 he was sent to congress, and served three terms. He declined the offices of minister to Paraguay and Uruguay, and of chief of the bureau of printing and engraving. In 1882 he was elected governor of Wisconsin and served three successive terms. In 1889 he was appointed secretary of agriculture. He died in 1893.

RUSKIN, John, art critic and political economist, and one of the most eloquent English prose writers of last century, was born at London in February, 1819. In 1843 appeared the first volume of Modern Painters, by a Graduate of Oxford, in which Ruskin maintained the superiority of modern landscape painters, especially Turner, to the older masters, and at the same time advocated a complete revolution in the received conventions of art and art

criticism. The subsequent volumes, of which the fifth and last appeared in 1860 expanded the subject into a most comprehensive treatise on the principles which underlie, or should underlie, art, while similar criticism was extended to another domain of art in his Seven Lamps of Architecture (1851) and his Stones of Venice (1851-53). In 1851 Ruskin appeared as a defender of pre-Raphaelitism, which had found inspiration in his works. As a political economist and social reformer he was an outspoken and uncompromising foe of what he considered the selfish and deadening doctrines of the so-called Manchester school, his chief works in this sphere being Unto this Last (1862), Munera Pulveris (1872), and Fors Clavigera (1871-84), a periodical series of letters



John Ruskin.

to the working-men and laborers of Great Britain. He died in 1900.

RUSSELL, John, Earl Russell, English liberal statesman, was the third son of the sixth duke of Bedford, was born in London in 1792, and died at Richmond in May, 1878. In Lord Melbourne's second cabinet (1835-41) Russell was home secretary, and in 1839 he became colonial secretary. From 1841 till 1845 he led the opposition against



John, Earl Russell.

Peel, with whom, however, he was in sympathy on the Corn Law question; and when Peel resigned in 1846 Russell formed a ministry and retained power, though with a small and uncertain majority, until February, 1852. He re-entered office in December, 1852, as foreign secretary under Lord Aberdeen, and in 1855 became colonial secretary in Lord Palmerston's cabinet. In 1865

Earl Russell succeeded Lord Palmerston in the leadership of the Liberal party, but when his new reform bill was rejected in 1866 the liberals resigned. Thenceforward Earl Russell held no farther office, though he warmly advocated all liberal measures.

RUSSELL, William Clark, novelist, born at New York in 1844. He went to sea at an early age, but abandoned his nautical career in 1865 and took to literature. Among his most popular books are *John Holdsworth Chief Mate*, *The Wreck of the Grosvenor*, *A Sea Queen*, *The Lady Maud*, *Jack's Courtship*, *Marooned*, *An Ocean Tragedy*, etc.

RUSSIA, one of the most powerful empires of the world, second only in extent to the British Empire, which has about 11,000,000 sq. miles, and third as regards population; the Chinese Empire ranking first, with about 400 million inhabitants, the British Empire second, with some 380 millions. It comprehends most of Eastern Europe and all of Northern Asia, and is bounded n. by the Arctic ocean; w. by Sweden, the Gulf of Bothnia and the Baltic, Prussia, Austria, and Roumania; s. by the Black sea, Turkey in Asia, Persia, Afghanistan, the Chinese Empire; e. by the Pacific and Behring's strait. The total area in 1906 was officially estimated at 8,644,100 sq. miles; while the population was as follows:

Russia in Europe (including Poland), 103,662,138; Finland (1900), 2,712,562; Caucasian Provinces, 9,251,945; Siberia, 5,731,552; Central Asia, 7,721,684; total, 129,079,881.

European Russia consists almost wholly of immense plains, the Valdai Hills, between St. Petersburg and Moscow, averaging 500 feet and never exceeding 1200 feet above sea-level, forming the only elevated region of the interior and an important watershed. Russia is watered by numerous and important rivers, some of great magnitude and running a course of thousands of miles. The Petchora, the Mezene, Northern Dwina, and Onega are the principal rivers of European Russia which send their waters to the Arctic ocean; the Neva, Volkhoff, Soir, Narova, Velikaya, Duna, Niemen, and Vistula belong to the Baltic basin; the Black sea basin comprises the Pruth, Dniester, Dnieper, and the Don; while the Caspian receives besides other rivers the Volga, the largest of all Russian rivers. Asiatic Russia has also a number of very large rivers, as the Obi, Yenisei, and Lena in Siberia, and the Amur toward the Chinese frontier.

Boundless forests exist, especially in the northern European provinces and the more temperate parts of Siberia, the area of the forest land in Europe being 42 per cent of the total area. The fir, larch, alder, and birch predominate. In the south forests are less abundant, and the tracts around the Black sea and the Caspian, and the immense steppes of the south and east, are almost wholly destitute of wood.

Among wild animals may be mentioned the bear, the wolf, wild hog, elk, and various animals which are hunted for their furs. Wild fowl abound, particu-

larly near the mouths of rivers. Both on the coasts and in the rivers a great number of productive fisheries are carried on. In the Arctic ocean vast numbers of seals are taken. The rivers of the Caspian, particularly the Ural and Volga, and the Sea of Azoff, are celebrated for their sturgeon. In the same quarters are also important salmon-fisheries. In the regions bordering on the Arctic ocean large herds of reindeer are kept; and in the south, among the Tartars of the Crimea and the inhabitants of the Caucasus, the camel is often seen.

Russia is rich in minerals. Gold, platinum, silver, copper, iron, lead, manganese, coal, salt, and saltpetre all exist in abundance, and there are copious petroleum springs in the Caspian region. The precious metals are chiefly obtained in the Ural and Altai regions, the annual production averaging: gold, 7200 lbs.; platinum, 5000-7000 lbs.; silver, 21,000-25,000 lbs. In the Ural, iron beds are also rich and numerous, exceeding all others in productiveness. Copper is most abundant in the government of Perm; lead in the Ural and some parts of Poland; saltpetre in Astrakhan. Of the coal-mines those of the Don basin are the principal at present, those of Kielce ranking second; the mines around Moscow come next. About 60,000 tons of manganese ore are annually extracted in the Ural and the Caucasus. The petroleum wells of Baku on the Caspian now send their products all over Europe.

Prior to the accession of Peter the Great Russia had no manufactories; he started them, and under the more or less fostering care of his successors they have steadily grown. Especially since 1865 a number of important industries have developed, this being mainly due to Russia's protective policy. The latest statistics give about 2,000,000 persons as being employed in the various manufacturing industries.

The bulk of Russia's external trade passes across the European frontier, and through the Baltic and Black sea ports. The chief exports are: grain (about one-half of entire exports), flax, linseed and other oleaginous seeds, timber, hemp, wool, butter and eggs, spirits, bristles, and furs, in the order indicated. The chief imports are cotton, wool, tea, machinery, coal and coke, cotton yarn, metal goods, wine, olive-oil, raw silk, herrings, textile goods, fruit, coffee, tobacco. The import trade is heaviest with Germany, Great Britain, China, United States, in order named. The more rapid development of the vast natural resources and trade of Russia is prevented by transport difficulties. The magnificent river and canal system is not available for a good part of the year, and railways are comparatively limited. The great railway across Siberia to Vladivostok and Port Arthur is practically complete. An important line recently constructed is the Transcaspian railway, from Michailovsk, on the southern shore of the Caspian, to Samarcand, via Bokhara. The latter is preëminently a military line, but it will also largely stimulate trade in the heart of Asia. Trade is

further assisted by immense fairs, which are much frequented by European and Asiatic merchants.

Until 1906 Russia was an absolute hereditary monarchy, the emperor (czar or tzar) being the supreme ruler and legislator, and the final tribunal in all matters political or ecclesiastical. The present emperor's income is about \$12,500,000. His title is Emperor and Autocrat of all the Russias, Czar of Poland, and Grand-prince of Finland. The administration is divided into ten departments, formerly eleven, with a minister at the head of each nominated by the emperor. Finland has nominally preserved its ancient constitution with a national parliament of four estates, but it is really ruled by a governing-general and senate appointed by the emperor. Some of the Baltic provinces also possessed certain privileges, but these are being gradually curtailed. Each government of the empire is under a governor and vice-governor; there are also a few general-governors, who have more than one government under them. The communes into which the provinces and districts are divided possess a certain amount of local government, and elect their own local dignitaries, but these are again subject to an all-powerful police. Russia is heavily in debt, chiefly abroad, Germany in particular holding large amounts of Russian stocks. The bulk of the revenue is obtained by indirect taxation, spirits furnishing about one-third of it, other items are personal and land taxes, trade licenses, tobacco and sugar, customs.

Russia possesses one of the most powerful armies in the world. On a peace footing it is placed at 1,100,000 men, the war strength at 4,600,000. Only a certain number of those annually reaching their twenty-first year are drawn into the active army, however, the rest entering the first and second reserve. Liability to military service is universal from the age of 21 to that of 43; and five years must, in regular course, be passed in active service.

The result of the Japanese war has to a large extent demoralized the Russian army. Nothing absolutely accurate as to losses, etc., sustained by Russia can be ascertained, and, therefore, the actual condition or strength of the army cannot be positively stated. One fact, however, is patent: Russia never had in Asia and Manchuria so great a number of men as 500,000, since one line of railroad is absolutely inadequate to supply more than 300,000, while the country is too poor to live off of. In every battle of the war Japan outnumbered Russia on the battle-field by from 10 to 40 per cent. That was the essence of Japanese strategy. The navy comprises 3 first and 9 second class battle ships, 14 coast defense, 5 armored cruisers, 4 protected or first class cruisers, 26 second and third class cruisers, 112 torpedo boats, etc. It ranks seventh among the navies of the world.

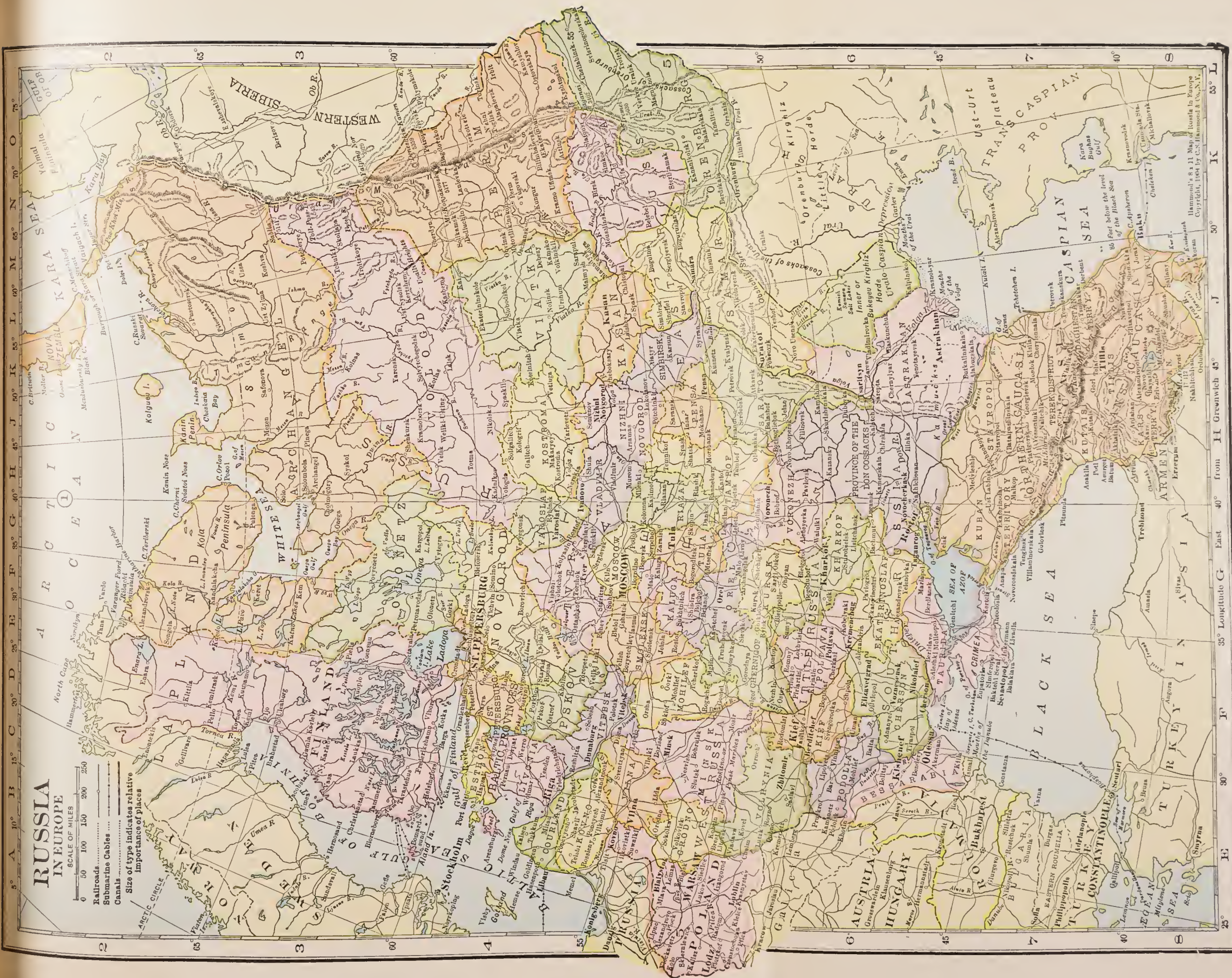
A number of languages and a vast variety of dialects are naturally spoken in a country comprising such a heterogeneous population, but the Russian is the vernacular of at least four-fifths of the inhabitants, the literary and official

RUSSIA IN EUROPE

SCALE OF MILES
0 50 100 150 200 250

Railroads.....
Submarine Cables.....
Canals.....
Size of type indicates relative
importance of places

Arctic Circle



Hammond's 8 x 11 Map of Russia in Europe
Copyright, 1904 by C.S. Hammond & Co., N.Y.

language being specifically the "Great Russian," or that belonging to Central Russia surrounding Moscow. It is one of the Slavonic family of the Aryan or Indo-European languages, and as such is a sister of Greek, Latin, Sanskrit, German, English, etc. Modern Russian has been much modified by the introduction of Greek, Tartar, and Mongolian terms. It has an alphabet of thirty-seven letters, a written and printed character of a peculiar form, and a pronunciation which it is hardly possible for any but natives to master. Its inflexions are both numerous and irregular; but it is soft, sonorous, remarkable for its copiousness, and affords unbounded facility for rhyme.

Until the 18th Century Russia was backward in the development of her literature. Lomonosof (1711-65) wrote a number of works both in prose and verse, and by his precepts and example did much to originate a national literature, and to fix the grammar of the language. His contemporary Sumarokoff carried the drama to a high degree of perfection; Derzhawin (1743-1816) distinguished himself highly in lyrical and other poetry; and since then many writers have distinguished themselves in all departments. It is, however, principally to Karamsin (1725-1826) that Russia owes the more general spread of literary taste. The foundation of the Russian academy in 1783, and the issue of its great dictionary, also contributed largely toward it. The same perfection which Karamsin gave to prose, Dimitrieff gave to poetry. Of the more modern authors particular mention is due to Alexander Pushkin, Russia's greatest poet, and Michael Lermontoff, not far his inferior. The most eminent novelists are Nicholas Gogol, Ivan Turgeneff, Feodor Dostoeffsky, Alexander Herzen, and Count Leo Tolstoi, the last not only a novelist but also one of the greatest of modern prophets. Russia possesses a number of valuable libraries. The first Russian press was set up at Moscow in 1554.

The established religion of Russia is the Eastern or Greek Church, and one of the fundamental laws of the state is that the emperor must belong to that church, and none of the imperial family may marry a wife belonging to another religion without the express sanction of the emperor.

The population of Russia is increasing faster than that of any other European nation, Great Britain, perhaps, excepted. As regards language (and so far also race) the peoples of Russia are comprised under the two great divisions of Aryans and Mongolians; the former include Slavonians, Germans, and Greeks, the latter the Finnish and Tartar races. The Slavonians form about 86 millions of the population, including 6½ million Poles. There are about 5½ million Finns, 2½ million Lithuanians, and some 3½ million Jews. Of Germans about 1½ million reside in Russia, of Roumanians and Servians 2½ millions. There are some 2½ million Georgians, Ossetes, and Lesghians, and 1 million Armenians. The Turco-Tartars count about 10 millions. A gradual absorption by the Slavonic races is go-

ing on. The political divisions of the Russian people comprise numerous grades of nobility, which are partly hereditary and partly acquired by military and civil service, especially the former, military rank being most highly prized in Russia. The clergy, both regular and secular, form a separate privileged order. Previous to the year 1861 the mass of the people were serfs, subject to the proprietors of the soil. The Emperors Alexander I. and Nicholas took some initial steps toward the emancipation of this class; but a bold and complete scheme of emancipation was begun and carried out by Alexander II. in 1861.

The origin of the Russian empire is involved in much obscurity, but it is usually regarded as having been founded by Rurik, a Scandinavian (Varangian), about 862, his dominions and those of his immediate successors comprising Novgorod, Kieff, and the surrounding country. Vladimir the Great (980-1015), the Charlemagne of Russia, introduced Christianity, and founded several cities and schools. But from this period down to 1237, when the country was overrun by the Tartars, Russia was almost constantly the scene of civil war.

In 1613 the house of Romanoff, whence the present czar is descended, was raised to the throne, and from this period the empire gained greater strength and consistency.

Russia's acquisition of territory for the past four centuries is shown by the following table:

	About sq. m.
Ivan the Great.....	1462, 382,716
Vassili Ivanovitch.....	1505, 510,288
Ivan the Terrible.....	1584, 1,530,864
Alexis Michaelovitch....	1650, 5,039,094
Peter I.....	1689, 5,953,360
Anna.....	1730, 6,888,888
Katharine II.....	1775, 7,122,770
Alexander II.....	1868, 7,866,940
Do.	1881, 8,325,393
Alexander III.....	1887, 8,644,100

The population from 14 millions in 1722 has grown to 129 millions in 1906. The extension of the Russian empire in the east is still going on. In 1881 the Tekké Turcomans were subjected; in 1884 Merv was taken; and Penjeh was occupied and annexed in 1885, which led to considerable friction between Russia and Britain. Of late years a great disturbing element to the government of Russia has sprung up in Nihilism (see Nihilists). The murder of the late emperor Alexander II. in the streets of St. Petersburg, by means of a bomb, was their doing; and repeated attempts on the life of his successor Alexander III. (1881-94) were also made. Alexander III. was succeeded by his eldest son, Nicholas II. Russian aggression in Manchuria and Corea led to the outbreak of war with Japan in February, 1904.

The most important events in the history of Russia have taken place within the last few years. These were the war with Japan (the greatest war of history) and the Russian Revolution, in which the monarchy was made a limited one. Previously to the year 1906 Russia was an absolute monarchy and affairs were in the hands of bureaus

under the supreme will of the czar whose title was Emperor and Autocrat of all the Russias, Czar of Poland, and Grand Prince of Finland. The revolution began to take shape in 1903 with the mutterings of the workingmen in the cities and outbreaks against the Jews. On April 19th of that year the atrocities at Kishineff took place, in which 40 Jews were massacred outright and several hundred injured. This was but a bare month after the proclamation of the czar establishing religious toleration.

The first actual step taken by the revolutionists was the assassination on May 19th of the Governor of Ufa, and in August the great industrial strikes began. Petitions by the workingmen asking for a representative government had been everywhere circulated, and toward the end of 1904 the emperor, having the Japanese-Russian war on his hands, issued a proclamation virtually refusing to consider a proposal for the modification of the form of government. On January 18, 1905, Father Gapon, followed by thousands of workingmen, gathered in St. Petersburg to appeal to the czar at the palace, but the crowd was dispersed by the soldiery, who killed and wounded a thousand or more. This act of butchery only fanned the flame of revolution and great strikes were called at Moscow, Riga, Revol, Odessa, Warsaw, Lodz, Radom and Kovno. On February 17th the Grand Duke Sergius, uncle of the emperor, was assassinated by the throwing of a bomb at Moscow. The mutinies of Odessa and Sevastopol followed, in which the rebels fired on Russian forts from Russian warships. The emperor, having granted the demands of the people for a constitution and a legislature, or national council, called the Duma, set May 10, 1906, as the day for its opening session. The chosen delegates gathered at the capital, but their meeting proved more or less farcical, as the Duma was dominated by the czar and dissolved by him before it could accomplish anything worth recording. The second Duma was likewise dissolved, and the third Duma was opened November, 14, 1907.

Meanwhile the war between Japan and Russia was brought to a close by the mediation of President Roosevelt, who had, on June 8, 1905, suggested a conference. The war had begun in 1903-4 with Russia's aggressions in Manchuria and the Russian Navy had been virtually wiped out. The following were the casualties:

	Russia	Japan
Army.....	314,779	163,086
Navy.....	6,000	3,670
Prisoners.....	67,101	646

The following table shows the naval losses of the two countries:

	Japan	Russia
Battleships sunk	2	12
Battleships captured		2
Armored cruisers sunk		5
Coast defense vessels "		1
Coast defense captured		2
Cruisers sunk	4	6
Other ships sunk	6	33
Other ships captured		16

On August 8, 1905, the peace delegates from Russia and Japan met at Ports-

mouth and in a few days the peace was concluded by Russia's consent to the limiting of Russian influence in the Orient and Japan's relinquishment of the claimed indemnity of \$600,000,000 and the cession of one-half of Sakhalin.

RUSSIAN-JAPANESE WAR, in 1894 and 1895, through the intervention of Russia and Germany Japan was deprived of its conquests in Manchuria, and in 1898 Russia secured by lease from China for 26 years, the harbors of Port Arthur, and Ta Lien Wau in the Liao-Tung peninsula, the very territory Japan had been forced to surrender possession of. The construction of the Manchurian railway connecting the newly acquired possessions with the main line of the Siberian railway was begun. During Boxer uprisings of 1900 a Russian force invaded Manchuria in retaliation of a Chinese attack of a Russian town on the Amur river. Russia refused to withdraw from Manchuria after agreeing with China to do so and after repeated delays on the part of Russia Japan, which declined its paramount interests in Korea, threatened by Russia, severed diplomatic relations with Russia and hostilities began on the night of February 7-8, 1904, with a torpedo attack delivered by the Japanese squadron against the Russian fleet in the harbor of Port Arthur. This was followed by the Japanese invasion of Korea, whose emperor was compelled to make common cause with Japan. The Japanese forces during the 18 months of war showed themselves superior on both land and water, defeating the Russians on land and compelling them to retreat as far north as Tie-lung and on sea by practically destroying the whole of the Russian fleet in the eastern waters.

The chronological story of the war is as follows:

Feb. 8-9, 1904—Variag and Korietz destroyed in Chemulpo harbor and Togo attacks Port Arthur fleet.

May 1—Japanese take Fengwang-cheng.

May 5—Japanese land at Pitsewo and begin to invest Port Arthur.

May 11—Russians evacuate Dalny, destroying the town.

May 26-27—Battles of Nanshan hill and Kinchow; loss, 5,130.

June 14-15—Oku defeats Stackelberg at Vafangow; loss, 11,000.

June 17—Battle of Motien Pass; Russians driven back.

June 30-31—Battle of Haicheng; loss, 5,700.

July 25—Russian forces driven out of Newchwang.

Aug. 10—Sortie from Port Arthur harbor; Russian fleet dispersed and in part destroyed; Vice-Admiral Witthoft killed.

Aug. 14—Kamimura defeats Vladivostok squadron; Rurik sunk.

Aug. 30-Sept. 4—Japanese, under Oyama, defeat Kuropatkin at Liaoyang; 365,000 engaged; loss, 35,000.

Sept. 11—Baltic fleet sails from Cronstadt under Rojestvensky.

Oct. 8-18—Kuroki defeats Kuropatkin at Shakhe river. Total casualties 61,679, with 23,000 killed.

Oct. 22—The "Doggerbank outrage." Two British fishermen killed.

Nov. 30—Japanese take 203-Meter hill by storm, losing 12,000.

Jan. 2—Stoessel surrenders Port Arthur to Nogi.

Jan. 26 to 31—Battle of the Hun river; Russians defeated with loss of 15,000; Japanese loss, 5,000.

LOSSES AND COST IN FIRST YEAR OF WAR—LOSSES IN MEN.

Russians killed, 60,000, wounded, 155,000, total, 215,000. Japanese killed, 65,000, wounded, 110,000, total, 175,000.

NAVAL LOSSES.

By Russia—Seven battleships, thirteen cruisers and fourteen gunboats, torpedo boats and destroyers. Total, 34 ships.

By Japan—One battleship, three cruisers, three transports and sixteen torpedo boats and destroyers. Total, 23 ships.

FINANCIAL COST.

Official figures by Russia, \$475,000,000; estimates made by Japan, \$360,000,000. Total cost to both countries, \$835,000,000. See Manchuria.

RUSSIA LEATHER is prepared in Russia chiefly from cow-hides tanned with willow, poplar, and larch bark, and is saturated with birch-bark oil, which gives it its peculiar odor. It is highly esteemed for its durability and imperviousness to water and insects, and is dyed in various colors, red and brown being the most frequent. It is much used for book-bindings and fancy articles. Similar leather from cow-hide is made of good quality in the United States. Large quantities of imitation Russia leather are made in Paris, but it lacks durability.

RUST, peroxide of iron, formed by the gradual oxidation of iron when exposed to the air. To remove rust the usual mode is to rub the object with a piece of oiled rag or emery paper. More rapid and more satisfactory results are secured by using very pure petroleum, and wiping with a hempen or woolen rag. To prevent rust, dip iron or steel articles in a mixture of equal parts of carbolic acid and olive-oil, rubbing the surface with a rag. Others rub the metal with a mercurial ointment, leaving a thin layer over the entire surface. If iron be dipped in a solution of carbonate of potash or soda in water the surface will be protected against rust for a long time, and objects can be protected for any period by burying in quicklime. Rubbing the surface with plumbago has a similar effect.

RUST, a disease which attacks cereals and many pasture grasses, known also by the names of red-gum, red-rag, red-robin. It is most common on the leaves, on which it is visible in the form of orange-colored mealy spots, but is by no means confined to them. It is produced by a species of fungus, the growth of which seems to be specially favored in ill-ventilated fields under excessive summer heat.

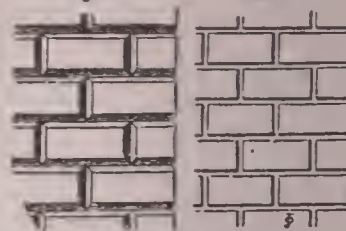
RUSTIC WORK in masonry is a term applied where the surface of a wall shows grooves between the different courses of stones thus giving the appearance of open joints.

RUTH, Book of, a canonical book of

the Old Testament. It is a kind of appendix to the Book of Judges, and an introduction to those of Samuel, and is therefore properly placed between them. The story of Ruth records in simple language the ancient rights of kindred, redemption, and other interesting customs of Hebrew antiquity. The date of the history and the name of its writer are unknown, but it is probably of a date subsequent to the captivity.

Fig. 1

Fig. 2



Rustle work.

1, With chamfered joints. 2, With rectangular joints.

RUTHE'NIANS, Russin'ians, Russniaks, Red or Little Russians, numerous Slavonic tribes inhabiting Eastern Galicia, Bukowira, and Northeastern Hungary, closely allied to the inhabitants of Podolia and Volhynia. The number of Ruthenians in the Austrian empire amounts to 3,000,000, of whom about 500,000 are settled in Hungary.

RUTHERFURD, Lewis Morris, American scientist, was born in Morrisania, N. Y., in 1816. He invented and constructed a number of instruments which proved of great value to astronomers. He constructed a micrometer for the measurement of astronomical photographs, for use upon pictures of solar eclipses or transits and upon groups of stars, of which he has measured several hundred, showing, that the photographic method is at least equal in accuracy to that of the heliometer or filarmicrometer and far more convenient. He was one of the original members named in the act of congress in 1863, creating the National Academy of Science. He died in 1892.

RUTLAND, the capital of Rutland co., Vermont, 117 miles n.n.w. of Boston. It is an important railway junction, and has valuable white marble quarries in its vicinity. Pop. 11,760.

RYE, a species of grain of which there are several varieties. It is an esculent grain bearing naked seeds on a flat ear, furnished with awns like barley. It is a native of the Levant, but has been cultivated in Europe from time immemorial. It thrives in climates and in soils which forbid wheat; requires less manure, and ripens faster. It is extensively grown in northern Europe, and rye bread forms the chief subsistence of the laboring classes of many parts of Russia, Sweden, Norway, Denmark, Holland, and Prussia. Unmalted rye-meal mixed with barley malt and fermented forms the wash whence is distilled the spirit known as Hollands gin. The straw is long, flexible, does not rot easily, and is used by brickmakers and thatchers, also for stuffing horse-collars, mattresses, etc., and for making baskets, straw hats, and bonnets. Rye is subject to a disease called ergot, which renders it dangerous for food.

S

S, the nineteenth letter of the English alphabet, representing the hissing sound produced by emitting the breath between the roof of the mouth and the tip of the tongue placed just above the upper teeth. From this circumstance it has sometimes been reckoned among the linguals (as the tongue is essential in its pronunciation), sometimes among the dentals (as the teeth co-operate in producing the hissing sound). More descriptively it is classed as a sibilant. It has a twofold pronunciation—sharp or hard as in sack, sin, this, thus; and soft or sonant (when it is equivalent to z), as in muse, wise.

SAALE (zä'lè), the name of several German rivers, the most important of which is that which rises on the north side of the Fichtelgebirge, in the northeast of Bavaria, and joins the Elbe after a course of above 200 miles. It passes the towns Hof, Jena, Naumburg, Merseburg, Halle, etc., and is of great commercial importance.

SABBATH (a Hebrew word signifying rest) is the day appointed by the Mosaic law for a total cessation from labor, and for the service of God, in memory of the circumstance that God, having created the world in six days, rested on the seventh. Sabbath is not strictly synonymous with Sunday. Sunday is the mere name of the day; Sabbath is the name of the institution. Sunday is the Sabbath of Christians; Saturday is the Sabbath of the Jews and some minor Christian sects. The first notice in the Old Testament pointing to the Sabbath occurs in Gen. ii. 2, 3; but the first formal institution of the day as a holy day and a day of rest is recorded in Exod. xvi. 22-26, on the occasion of the children of Israel gathering manna in the wilderness. Soon after the observance of the day was re-enacted still more expressly and emphatically in the tables of the law. Prior to the captivity the Jews kept the Sabbath very indifferently, but after their return from Egypt Nehemiah exerted himself to secure the true observance. Gradually the original law became encumbered with a long list of petty pharisaical and rabbinical regulations. The Sabbath began at sunset on Friday and ended at sunset on Saturday. On the Sabbath the Jews were not allowed to go out of the city further than 2000 paces, that is, about a mile, and this distance was called a Sabbath-day's journey. And as every seventh day was a day of rest to the people, so was every seventh year to the land. It was unlawful in this year to plough or sow, or prune vines; and if the earth brought forth anything of its own accord, these spontaneous fruits did not belong to the master of the ground, but were common to all. This year was called the Sabbatical year, and was also to be a year of release for Jewish debtors. In the gospels the references to the Sabbath are numerous, and they show us that Christ always paid respect to the institution although he did not regard the minute prohibitions that had been added to the original law. The desire of distinguishing the Christian from the Jewish observance early gave rise to

the celebration of Sunday, the first day of the week, instead of the Sabbath. In 366 the Council of Laodicea removed all scruples as to the duty of Christians to keep the Jewish Sabbath. See Sunday.

SAB'INES, an ancient people widely spread in middle Italy, allied to the Latins, and already an important nation prior to the foundation of Rome. Originally they were confined to the mountain districts to the n.e. of Rome, and their ancient capital was Amiternum near the modern Aquila. As an independent nation they ceased to exist in 290 B.C., when they were incorporated with the Roman state.

SABLE, a carnivorous mammal, nearly allied to the common marten and pine marten, found chiefly in Siberia and Kamtchatka, and hunted for its fur. Its length, exclusive of the tail, is about 18 inches. Its fur, which is extremely lustrous, and hence of the very highest value, is generally brown, grayish-yellow on the throat, and with small grayish-yellow spots scattered on the sides of the



Sable.

neck. It is densest during winter, and owing to the mode of attachment of the hairs to the skin it may be pressed or smoothed in any direction. The skins of these varieties are frequently dyed and otherwise manipulated to imitate the true Russian sable. Sable hair is also used in the manufacture of artist's pencils. Sable fur has been of great value from very early times.

SABLE, in heraldry, black, one of the tinctures used in blazonry. In engraving it is expressed by perpendicular crossed by horizontal lines.

SABLE ISLAND, a low treeless sandy island in the North Atlantic, off the east coast of Nova Scotia, 20 miles long and 1 to 5 broad. It has a refuge for shipwrecked persons and a lighthouse. Many shipwrecks have occurred on it. It is gradually disappearing.

SABOTS (sâ-bō), wooden shoes made each of one piece hollowed out by boring tools and scrapers. They are largely worn by the peasantry of several European countries, being well adapted to protect the feet against damp. In France their manufacture forms an important industry. The willow, beech, and ash are the favorite woods for sabotmaking.

SABRE, a broad and heavy sword, thick at the back and somewhat curved

at the point. It is the chief weapon of cavalry regiments.

SABRE-TACHE, a leathern case or pocket won by cavalry officers at the left side, suspended from their sword-belt. It is rather ornamental than useful, and its face bears the regimental emblems, number, etc.

SACBUT, or **SACKBUT**, a musical instrument of the trumpet kind with a slide; in fact an old variety of trombone. The instrument called sabbeka in the Hebrew scriptures has been erroneously rendered as sacbut by the translators. The exact form of the sabbeka has been



Assyrian sacbut, from bas-relief.

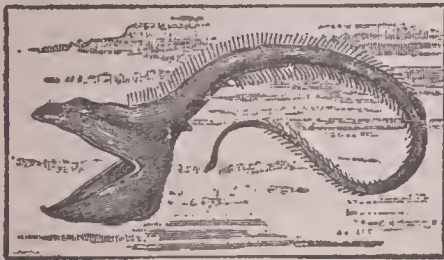
much disputed, but that it was a stringed instrument is certain, for the name passed over into Greek and Latin in the forms sambukē, sambuca, a harp-like instrument of four or more strings. The instrument shown in the accompanying illustration is believed to represent a form of the sacbut of scripture.

SACCH'ARIN, an artificial sugar prepared from coal-tar, first introduced to commerce in 1887 by its discoverer Dr. Constantin Fahlberg of Salbke (Germany). Its sweetening properties are enormous; one grain of saccharin is said to sweeten distinctly 70,000 grains of distilled water. It is not a fermentable sugar, and is already in common use in the treatment of disease, as diabetes, for instance; and in many cases in which the palate craves for sweets, but in which ordinary sugar cannot without danger be permitted. It is also used by stout persons, or those inclined to become so, in order to lessen the formation of fat. To a certain extent it now competes with natural sugars, especially in confectionery and preserving. There is some doubt as to its effects on the human system. The French Conseil d'Hygiène et de Salubrité appointed a commission to inquire into its properties, and their report, issued in 1888, stated that its use in food would seriously affect the digestive functions. The discoverer and other chemists, both British and foreign, have denied, however, that saccharin is injurious, and it is also asserted that the hostility to this sweetening substance emanates chiefly from persons interested in the beet-sugar industry. Saccharin has come largely into use in Germany in the manufacture of confectionery, in brewing, etc.

SACCHAROMETER, or **SACCHARIMETER**, an instrument for determining the quantity of saccharine matter in any

solution. One form is simply a hydrometer for taking the specific gravity of the solution; another is a kind of polariscope, so arranged that the solution may be interposed between the polarizer and analyzer, and by observing the angle through which the plane of polarization is turned in passing through the solution the datum is given for the calculation of the strength. (See Polarization.) Several saccharometers acting on this principle, but varying somewhat in construction, are now in use.

SAC'COPHARYNX, or **EURYPHARYNX**, a genus of eels. The best-known



Saccopharynx.

species was discovered only a few years ago. It inhabits the depths of the Atlantic, is of a perfectly black color, is sometimes 9 feet in length, and but seldom met with. It owes its name to its pouch-like pharynx, which enables it to swallow other fish of large dimensions. The muscular system is but little developed, and the bones are thin and soft.

SACK, formerly a general name for the different sorts of dry wine, more especially the Spanish, which were first extensively used in England in the 16th century.

SACO, a river in the United States. It rises in New Hampshire, in the White mountains, and runs southeast into the Atlantic below Saco, in Maine. It is 160 miles long, and has falls of 72 feet at Hiram, of 42 feet at Saco, and numerous minor ones.

SACRAMENT, Latin, sacramentum, a pledge, an oath, in particular the military oath of allegiance. This word received a religious sense, in the Christian church, from its having been used in the Vulgate to translate the Greek *mysterion*, a mystery. Among the early Latin ecclesiastical writers sacramentum, therefore, signifies a mystery, a symbolical religious ceremony, and was most frequently applied by them to the rite of baptism. In modern Christian theology sacrament is defined as an outward and visible sign of an inward and spiritual grace, a solemn religious ceremony enjoined by Christ to be observed by his followers, and by which their special relation to him is created, of their obligations to him renewed and ratified. In early times the church had numerous sacraments, as many as thirty being enumerated in the first half of the 12th century. The Roman and Greek churches now recognize seven sacraments: baptism, confirmation, the Eucharist, penance, extreme unction, orders, and marriage. Protestants in general hold baptism and the eucharist to be the only sacraments. The Socinians regard the sacraments merely as solemn rites, having no divine efficacy, and not necessarily binding on Christians. The

Quakers consider them as acts of the mind only, and have no outward ceremonies connected with them.

SACRAMEN'TO, a river in California. It rises in the Sierra Nevada, on the borders of Oregon, and drains the central valley of California from the north. Its course is about 500 miles, 300 of which are navigable for small steamers. It discharges its waters into the Bay of San Francisco.

SACRAMENTO, the capital of California, in the county and on the river of same name, 80 miles northeast of San Francisco. It occupies a low and level site, and vast sums of money have been spent for embankments, and in raising the street levels, so as to secure the town against inundation by the river. Sacramento owes its origin and prosperity to the northern gold-fields. It has suffered much from water and fire during its short existence, but is now a regular and well-built city, boasting of many good buildings. The state capitol, centrally



State capitol, Sacramento, Cal.

situated in a large, well-laid-out park, is a grand structure, and cost about \$5,000,000. Pop. 1909, 46,000.

SACRIFICES, gifts offered with some symbolic intent to the Deity, generally an immolated victim or an offering of any other kind laid on an altar or otherwise presented in the way of religious thanksgiving, atonement, or conciliation. The origin of sacrifice is a point much disputed; the two opposed views being that of a primeval appointment by the Deity, and that of a spontaneous origination in the instinctive desire of man to draw near to God. The symbolic character of sacrifice may be represented under three heads: (1) Propitiatory, or designed to conciliate generally the favor of the Deity; (2) Eucharistic, or symbolical of gratitude for favors received; (3) Expiatory, or offered in atonement for particular offenses. To a different class may be assigned deprecatory sacrifices designed to avert the wrath or appease the wicked disposition of deities. The customs of the Jews regarding sacrifice are noteworthy on account of their very express and explicit claims to a divine origin, and because of their connection with the Christian religion. Details are amply given in the Book of Leviticus. Few religions, whether ancient or modern, have omitted sacrifices from among their rites. The ancestors of all the existing races in Europe practiced human sacrifices, and similar usages widely prevailed throughout the world. Among Christians the

Roman Catholic and Greek churches regard the mass as a mysterious sacrifice; but with Protestants it is not generally so regarded.

SA'CRUM, in anatomy, the bony structure which forms the basis or inferior extremity of the vertebral column. The human sacrum forms the back part



Pelvic bones. s, sacrum.

of the pelvis, is roughly triangular in shape, consists of five united vertebræ, and from its solidity it is well adapted to serve as the keystone of the pelvic arch, being wedged in between and articulating with the haunch-bones. In most mammals the number of vertebræ forming the sacrum is smaller than in man. In birds the lowest number is about ten. Fishes possess no sacrum at all. The sacrum in man is fully ossified and completed in development from the twenty-fifth to the thirtieth year of life, but the component parts can generally be perceived even in the most aged individuals.

SAD'DUCEES, one of the two chief sects or parties existing among the Jews in the time of Christ. Various accounts are given of their origin. Some critics recognize in the Sadducees the descendants and adherents of the Zadok mentioned in 1 Kings i. 39.

SAFE, a receptacle for valuables, of iron or steel, or both combined. A safe to answer all requirements should be fire, explosive, acid, drill, and wedge-proof. A fire-proof safe need only be so constructed that, although exposed to the intense heat of a conflagration, its inner recesses remain at a sufficiently low temperature to prevent combustion of the contents. A burglar-proof safe needs many other safe-guards, and the history of safe-making is mainly a record of struggles between the safe manufacturer and the burglar; the result is that safes can now be obtained which are all but impregnable. The safe consists of an outer and an inner wall, the space between being filled with some fire-proof material such as asbestos, silicate cotton, gypsum, etc. The outside casing, which may be single or compound, naturally receives the greatest attention, and various are the devices of manufacturers to render it sufficiently hard and solid to resist the finely-tempered drills of the burglar. To prevent wrenching, the door is secured by bolts moving straight or diagonally into slots on one or on all sides. These bolts are moved by the door handle, and the lock-key fixes them in their positions. With the modern safe of the best kind, the lock may be said to be the only vulnerable point, hence much care and ingenuity have been expended on its mechanism. The first great improvements in locks, as applied to safes, are due to Chubb of London, a name which still stands in the front ranks of safe-lock makers; but numerous

SAFE DEPOSIT COMPANIES

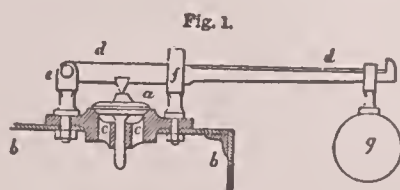
patents, mostly of American origin, have in recent years been introduced. Of these the keyless permutation locks deserve particular mention, as they obviate the danger which arises from lost or false keys. Such locks allow of opening only after an indicator has been moved in accordance with a certain combination of numbers arranged before closing the safe. Some safe-locks are so constructed that to be freed they require different keys on different days, some can only be opened at a certain hour, this being fixed on before the door is closed; while others again require two or more keys in charge of different persons; in fact, the arrangements contrived to render the plundering of safes next to impossible are too numerous even to mention. The connection of safes with electric alarms in a variety of ways forms another safeguard.

SAFE DEPOSIT COMPANIES, are among the comparatively recent additions to the list of bodies corporate, organized for a specific purpose, and operating under and by virtue of statutory law or special acts of state legislatures. Deposit companies were formed for the purpose of receiving deposits of valuables of almost every description, such as bonds, notes, mortgages, jewelry, gold and silver ware, family heirlooms, wills, and other legal documents, etc., companies guaranteeing to owners, upon payment by the latter of a premium corresponding to the risk undertaken, absolute security, from loss by fire or otherwise, to the articles deposited. The acts of incorporation also authorize the construction of such buildings, safes, and other appurtenances as will promote the security contemplated and the faithful execution of the trust created for the benefit of depositors. The vaults or safe deposits for the storage of valuables are constructed after the latest designs, of the most substantial material, and provided with every appliance known to scientific investigation or mechanical development for attaining the end in view, i. e., absolute security from visitations either by burglars or the elements. The interior of these vaults is peopled, so to speak, with boxes and safes in which are contained the valuables of clients, access to which is obtained by keys, one being held by the lessee and the other by the company. The vaults are opened and closed by electricity at designated hours, and their protection is further guaranteed by locks and bolts, as also by the presence of custodians, who are relieved at intervals by colleagues. Automatic signals are connected with the police department and private detective agencies of cities in which the company does business, and either upon the sounding of the alarm or its failure to signal "all is well," as the device is constructed to do, investigation is at once instituted to ascertain the cause. A pass-word is employed by some of the companies as a further preventive against intrusion, and other agencies are adopted as rapidly as they become available.

SAFETY-LAMP, a lamp for lighting coal-mines without exposing the miners

to explosions of fire-damp. The first safety-lamp was invented by Sir Humphry Davy in 1816, and until a quite recent period his system, with some slight modifications, was in general use. It consists principally of a cistern to hold the oil, in the top of which the wick is placed. Over the cistern a cylinder of wire-gauze is fixed so as to envelop the flame. The lamp is closed by a bolt passing through both parts, and to prevent the miner from exposing the flame a locking arrangement exists. The diameter of the gauze wire is from $\frac{1}{10}$ to $\frac{1}{8}$ of an inch, and the apertures do not exceed the $\frac{1}{2}$ of an inch square. The Stephenson lamp, better known among miners as the "Geordie," has a glass chimney as well as the wire-gauze and the air to feed the flame enters through a perforated ring just below the wick. This lamp, though safer than the Davy, if used with care, becomes a source of danger if the perforated ring is allowed to get clogged and the glass chimney overheated. A series of trials with safety-lamps, made in Britain by a committee of the Midland institute, led to the condemnation of the ordinary Davy and Stephenson lamps and to the introduction of the Mueseler, Marsant, and several other lamps, which had been used with satisfaction in Belgian and French mines. They are, however, all modifications of the principle which underlies the original invention of Sir Humphry Davy. A safety-lamp recently brought before the public is the Thornebury, which is said to be self-extinguishing in an explosive mixture of fire-damp and air, to give a strong light, to be simple in construction, and absolutely safe. There are also several electric miner's lamps in the market.

SAFETY-VALVE, a contrivance for relieving the pressure of steam before it becomes too great for the calculated strength of the containing vessel. The commonest form of safety-valve on



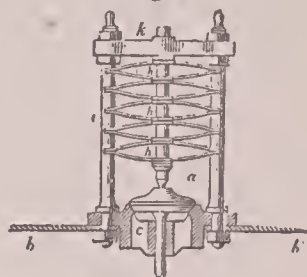
Lever safety-valve.

steam-boilers is a lid (valve), pressed against a hole (seat) by either a spring or a weight; the spring or weight not exerting a greater force than can be overcome by the pressure of the steam inside, part of which then escapes and obviates any danger. The valve is round, is bevelled round the edge, and is furnished with a spindle which moves loosely in a guide attached to the seat; the seat is bevelled to fit the edge of the valve. On locomotive and on ship's boilers the valve is pressed against the seat by a spring arrangement; but on stationary boilers a weight should always be employed. Fig. 1 shows a safety valve, in which a weight is employed. Here a is the valve, b b the boiler, c c the valve-seat, usually, like the valve itself, made of gun-metal, d the lever turning upon a fixed center at e, and pressing upon the valve by a steel point, f a guide

SAGE

for the lever, g a weight which may be shifted backward and forward according to the pressure desired. Fig. 2 shows a form of spring safety-valve, in which a series of bent springs h h h are placed

Fig. 2



Spring safety-valve.

alternately in opposite directions, their extremities sliding upon the rods i i, and the springs being kept down by the cross bar k; a being the valve, c the valve-seat, and b b part of the boiler.

SAFFRON, a low ornamental plant with grasslike leaves and large crocus-like purple flowers, cultivated in the East and in Southern Europe for the sake of its stigmas. These when dried form the saffron of the shops, which has a deep-orange color, a warm bitterish taste, and a sweetish penetrating odor. Its orange-red extract is used by painters and dyers, and the saffron itself also in cookery and confectionery as a coloring and flavoring substance.

SAGE, Russell, American capitalist, was born in Shenandoah, Oneida co., N. Y., in 1816. In 1852 he was elected to congress as a whig, and reelected in 1854, serving on the Ways and Means committee. He removed to New York City in 1863 and became largely interested in railroad investments. He was associated with Jay Gould in the control of the Wabash, the St. Louis and Pacific, and other western roads, and in the Western Union Telegraph company and the Manhattan Elevated Railroad system of New York City. He died in 1906.



Sage. 1, inflorescence; 2, lower part of stem with leaves.

SAGE, the common name of a very large genus of plants containing about

450 species, widely dispersed through the temperate and warmer regions of the globe. They are herbs or shrubs of widely varying habit, usually with entire or cut leaves and various-colored (rarely yellow) flowers. The best known is the *S. officinalis*, or garden sage. This plant is much used in cookery, and is supposed to assist the stomach in digesting fat and luscious foods. Sage-tea is commended as a stomachic and slight stimulant.

SAGE-BRUSH, a low irregular shrub of the order *Compositæ*, growing in dry alkaline soils of the North American plains. The name is also given to other American species of *Artemisia*.

SAGINAW, the capital of Saginaw co., Michigan, on both sides of the Saginaw river, here navigable for the largest lake craft, about 17 miles from Lake Huron. Saginaw is well supplied with railway connections; and there are numerous saw-mills and other industrial establishments. Pop. 1909, about 55,000.

SAGITTA'RIUS (the Archer), in astronomy, the ninth sign of the zodiac, into which the sun enters November 22. The constellation consists of eight visible stars. It is represented on celestial globes and charts by the figure of a centaur in the act of shooting an arrow from his bow.

SAGO, a starchy product obtained from the trunk of several species of a genus of palms named *Sagus*, from which the finest sago is prepared. They form immense forests on nearly all the Moluccas, each stem yielding from 100 to 800 lbs. of sago. The tree is about 30 feet high, and from 18 to 22 inches in diameter. It is cut down at maturity, the medullary part extracted and reduced to powder like sawdust. The filaments are next separated by washing, and the meal laid to dry. For exportation the finest sago meal is mixed with water, and then rubbed into small grains of the size and form of coriander



Sago palm.

seeds. The Malays have a process for refining sago, and giving it a fine pearly luster, the method of which is not known to Europeans; but there are strong reasons to believe that heat is employed, because the starch is partially transformed into gum. The sago so cured is in the highest estimation in all the European markets. Sago forms a light, wholesome, nutritious food, and may be used to advantage in all cases where a farinaceous diet is required. It is also

largely used in the manufacture of soluble cocoas, and for adulterating the common sorts of arrowroot.

SA'GOIN, or **SAGOUIN**, the native South American name of a genus of

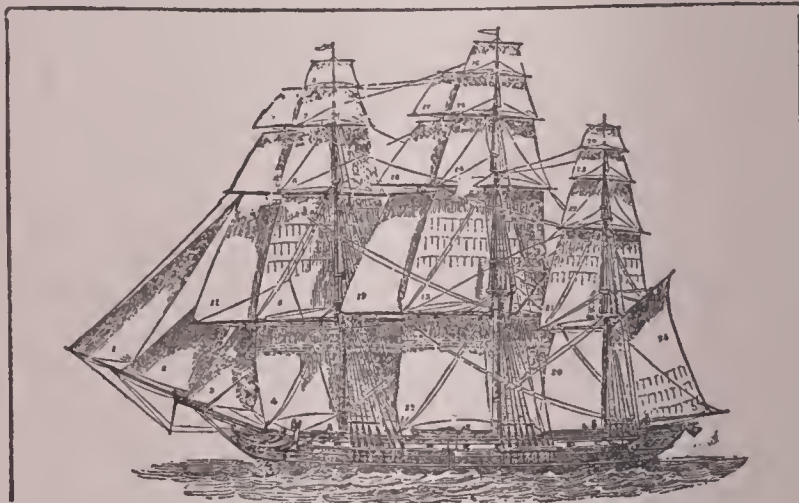


Sagoin.

Brazilian monkeys of small size, and remarkably light, active, and graceful in their movements.

SAGUENAY (sag'e-nā), a river of Canada, province of Quebec, formed by two outlets of Lake St. John, which

and presenting some very high mountain masses. Between Tibesti and the Niger we have the elevated region of Air, and toward the Atlantic Adrar. These plateaux are intersected by many fertile valleys fit for agriculture and pasture. Other parts of the desert are broken by large oases with a most luxuriant vegetation, such as Twat, Wargla, and Fezzan. On the borders of Algeria oases have been created artificially by means of artesian wells. A vast tract of true desert, El Djuf, lies in the west central region, and unites all the worst characters of the desert—want of water, intense heat, and moving sands. In the desert proper there is little of animal or of vegetable life. A few species of antelopes, the wild ass, the mountain sheep, the hyæna, the baboon, the tortoise, and the ostrich, are met with in favored spots. Lizards, jerboas, and serpents of many kinds retain undisturbed possession of the burning sands. Where herbage exists it is mainly composed of such plants as require but little moisture. The vegetable wealth of the desert-dweller lies in the date-palm. The population, estimated at about 2½ millions, consists of various tribes of Arabs, Berbers, and negroes. The Berbers are almost confined to the west-central and the negroes to the east-central parts,



Sails of a full-rigged ship.

unite about 9 miles below the lake, from which point the river flows s.e., and falls into the St. Lawrence at Tadousac harbor; length about 100 miles.

SAHARA (sa-hā'ra; properly sā'ha-rā) The, that vast and mainly desert tract of Northern Africa lying north and south of the Tropic of Cancer, between the Atlantic and the Nile. In the north it extends to and forms part of Morocco, Algeria, Tunis, Tripoli, and Egypt; in the south it is chiefly bounded by the Soudan. This immense area, calculated at over 3½ million square miles, is not, as popularly supposed, a great level desert; on the contrary, it offers considerable variety of configuration and vegetation. The surface ranges from below sea-level to 8000 feet above it. There are the extensive and elevated plateaux of Tassili, Tibesti, etc., about the center of the Sahara, running from the north in a southeasterly direction,

while the Arabs predominate in the other regions. Camel-breeding, slave and salt dealing, caravan conducting, and brigandage form the chief occupations of a large section. A number of caravan routes through the Sahara connect Timbuctoo and the Soudan with the maritime countries in the north. Recent explorations have finally disposed of the idea that the Sahara is the dried-up bed of a former inland sea, and that it could be restored to its former condition by admitting the waters of the ocean. The diluvial sea theory is now limited to the low-lying districts, El Djuf and Kufra, which abound in rock-salt deposits. A great part of the western Sahara is claimed by France. Spain has annexed a portion of the littoral and interior between Morocco and Senegal.

SAHARUNPUR (sa-hā-ran-pur'), a town in Hindustan, capital of the dis-

trict of the same name, in the United Provinces. It has many handsome residences in the European style, a government stud, a botanic garden, and a large sugar and grain trade. Pop. 66,254.

SAIL, a piece of cloth or tissue of some kind spread to the wind to impel or assist in impelling a vessel through the water. Sails are usually made of several breadths of canvas, sewed together with a double seam at the borders, and edged all round with a cord or cords called the bolt-rope or bolt-ropes. A sail extended by a yard hung by the middle is called a square sail; a sail set upon a gaff, boom, or stay, so as always to hang more or less in the direction of the vessel's length, is called a fore-and-aft sail. The upper part of every sail is the head, the lower part the foot, the sides in general are called leeches. The lower two corners of a square sail are in general called clues, and are kept extended by ropes called sheets. Sails generally take their names, partly at least, from the mast, yard, or stay upon which they are stretched; thus, the main-course, main-top sail, main-topgallant sail, are respectively the sails on the mainmast main-topmast and main-topgallantmast. The names of the sails shown in foregoing cut are: 1, flying jib; 2, jib; 3, fore-topmast staysail; 4, fore-course (or fore-sail); 5, fore-topsail; 6, fore-topgallant sail; 7, fore-royal; 8, fore-sky-sail; 9, fore-royal studding-sail; 10, fore-topgallant studding-sail; 11, fore-topmast studding-sail; 12, main-course (main-sail); 13, main-top sail; 14, main-topgallant sail; 15, main-royal; 16, main-sky-sail; 17, main-royal studding-sail; 18, main-topgallant studding-sail; 19, main-topmast studding-sail; 20, mizzen-course (cross-jack); 21, mizzen-top-sail; 22, mizzen-topgallant sail; 23, mizzen-royal; 24, mizzen-sky-sail; 25, spanker or driver. The vessel represented might, however, carry additional sails to those shown, in the shape of staysails, etc.; and in modern ships the top sails and topgallant sails are often divided into lower and upper. Four-masted ships are now not uncommon. See Ship.

SAINT CLAIR, a lake in North America, situated between Lake Huron and Lake Erie, and connected with the former by St. Clair river, with the latter by Detroit river. It is 30 miles long, greatest breadth 24 miles, area 360 sq. miles. It contains several fine islands. The river St. Clair, which separates Canada and the United States, is about 40 miles long, 1 mile wide, and navigable.

SAINT CLOUD, a city and the county seat of Stearns co., Minn., 65 miles northwest of Minneapolis; on the Mississippi river and the Great Northern and Northern Pacific railroads. It is the seat of a state normal school and of the Minnesota State reformatory. Pop. 10,663.

SAINTE AUGUSTINE, a city and seaport and capital of St. John's co., Florida on an inlet of the Atlantic, and a fashionable health resort during winter. It is said to be the oldest town in the United States, having been founded by the Spaniards about 1565. A few specimens of Spanish architecture remain, but these are rapidly making way for

modern structures, and the town is putting on a new appearance. The Hotel Ponce de Leon is a monumental building in the early Spanish Renaissance style. It occupies a great extent of ground, and its architecture is rendered effective by distribution of plan, by lofty towers, corner turrets, arcades, and low-pitched overhanging tiled roofs. It has also garden courts and ornamental gardens. There are also other large hotels and several fine churches. Permanent population about 4800, but in winter over 10,000.

SAINTE-BEUVE (sant-beuv), Charles Augustin, a French writer, and one of the greatest of modern critics, born at Boulogne 1804, died at Paris 1869. The cross of the Legion of Honor was bestowed on him in 1859, and the senatorship in 1865. Most of his critical writings have been republished in various editions.

SAINT HELENA. See Helena (St.).

SAINT JOHN, a city and port of Canada, province New Brunswick, capital of St. John co., at the mouth of the river of the same name, which here enters the Bay of Fundy. It is built on rocky and irregular ground, and presents on the whole an attractive appearance. The harbor is commodious, spacious, never freezes, and is well protected by

leges and schools, has a fine court-house, splendid opera-house, large central railroad depot, etc. It is the most commercial and populous town of Western Missouri, and an important railway center. It has manufactories of railway carriages and wagons, furniture, engines and boilers, stoves, clothing, flour-mills, boot factories, etc. Pop. 124,450.

SAINT-JUST (san-zhüst), Antoine Louis Léon Florelle de, one of the most prominent men in the French revolution, born 1767, executed 1794. He was an effective speaker, but unscrupulous and uncompromising. The guillotine was his general answer to all arguments and actions which did not harmonize with his own. He fell with Robespierre through the events of the 9th Thermidor.

SAINT LOUIS (lu'i or lu'is), the chief city of the lower Mississippi valley, the commercial metropolis of the State of Missouri, is situated on the west bank of the Mississippi, less than 20 miles from its confluence with the Missouri, and 185 miles north of the influx of the Ohio. It is distant by river about 1,200 miles from New Orleans, and 729 miles from St. Paul, the head of navigation upon the upper Mississippi. It is situated in the center of the great valley, through which the waters of the



Union station, St. Louis.

batteries. St. John is the great commercial emporium of New Brunswick, and has in particular a great trade in lumber. The fisheries are very important, and ship-building and a variety of other industries are briskly carried on. Pop. 40,711.

SAINT JOHN, a river partly belonging to the United States, partly to Canada, the last 230 miles of its course being in New Brunswick; total length 550 miles. It is navigable for large steamers to Fredericton, a distance of 80 miles. About 225 miles up are the Grand Falls, 75 feet high. The city of St. John is at its mouth.

SAINT JOHN'S, capital of Newfoundland, on Avalon peninsula in the southeast. Pop. 30,486.

SAINT JOSEPH, a highly prosperous city in the United States, capital of Buchanan county, Missouri, on the river Missouri, which is crossed by a fine iron railway bridge. It is noted for its col-

Missouri, Mississippi, Ohio, Illinois and other smaller but navigable streams find their way to the Gulf of Mexico. St. Louis is built upon a series of undulating hills or terraces that rise one above the other from the river for miles to the west.

The plan of the city is rectilinear. In the old portion of the city, laid out by the early French inhabitants, the streets are narrow, and the blocks average 300 feet square. In the newer portion of the city the streets are wide and lined with shade trees. The east and west streets run from the river at right angles. One of these, Market street, is the dividing center line. The sewer system is most extensive, surface drainage being unknown in the city. The largest sewer, known as the Mill Creek, following the line of a natural drain, is twenty feet wide and fifteen feet high. The city is lighted every night of the year by electricity. The

alleys are brightly illuminated with incandescent electric lights, and the streets proper with arc-lights swung over the streets at an elevation of forty-five feet.

The twenty-three public parks, places, and gardens of the city have a total area of 2183 acres, including that part of Forest park temporarily used as part of the grounds of the Louisiana Purchase Exposition. Forest park, the largest of these, dates from 1874. It is almost directly west of the business center. Its area of 1371 acres represents a cost of \$2,304,669 for ground and improvements. The school system of Saint Louis is notable in several particulars, chiefly in its application of the theory of manual training in connection with the work of Washington university, and in its pioneer work in illustrating the practical workings of the theories of Froebel. The city has begun supplying free books, and supports the free public library as an essential part of the system of public education. Among the private institutions are Washington university, with the Manual Training school and School of Fine Arts, University of Saint Louis, Forest Park University for Women, the Christian Brothers' college, the Saint Louis College of Physicians and Surgeons, the Homeopathic Medical College of Missouri, the Missouri School for the Blind, the Kenrick Theological seminary, and the Saint Louis Law school, now a department of Washington university. The principal libraries are the Public and the Mercantile. Among minor libraries, that of the Missouri Historical society is most important. The principal theatres are the Olympic, the Century, the Garrick, the Grand Opera House, the Imperial, Havlin's, the Odéon (Grand Avenue), and the Columbia. The Grand Opera House has a seating capacity of 2200, and the Olympic 2400.

The railroad systems of which Saint Louis is a center converge here from all parts of the United States and also from Mexico and Canada, though the country in which the city has fostered railroad development most in marketing its output lies south of Nebraska and west of the Mississippi. The twenty-four railroads of which it is a terminus have dwarfed the influence of the Mississippi as the determining factor of its trade without lessening the great advantage of direct river communication with tide water. Though Saint Louis is important as a manufacturing city and markets its own industrial output, it is still more important commercially as a distributing center for products representing the entire country. Its location makes it a point of clearing between manufactured products and the products of the soil for which they are exchanged. East Saint Louis, the principal industrial suburb on the Illinois side of the river, is connected by the magnificent Eads Bridge for railroads, wagons, and foot passengers. (See Bridge.) The Merchants' Bridge connecting the Illinois terminals of Saint Louis railroads with the Union Station system of terminals is for railroads only. The Union Station covers about eleven acres of ground with its main building and adjacent sheds. Saint Louis is a port of entry.

Its exports are chiefly to Mexico, South America, and the West Indies. Its direct trade with the Philippines, mainly in malt liquors, has assumed some importance. The principal export shipments of flour and grain are to Central and South America, Cuba, England, Scotland, Ireland, Holland, and Germany. Exports to Europe consist largely of provisions. The principal items are dry-salt and sweet pickled meats, oleo, lard and hides. Exports of agricultural supplies, hardware, electrical supplies, machinery, glass, etc., are mostly to Spanish America. The city is "the largest tobacco market in the world." Population 1909, estimated at 704,000.

SAINT LOUIS WORLD'S FAIR, the international exposition held at Saint Louis from April 30, 1904, until November the same year. It was held to commemorate the centenary of the purchase of the Louisiana territory by the United States. Thirty-four states and territories and many foreign governments were largely represented, and many of them erected special and typical structures. The administrative system of the Exposition included four executive divisions: Exhibits, Exploitation, Works, and Concessions and Admission. The Division of Exhibits comprised the following fifteen departments: Education, Art, Liberal Arts, Manufactures, Machinery, Electricity, Transportation, Agriculture, Horticulture, Forestry, Mining and Metallurgy, Fish and Game, Anthropology, Special Economy, and Physical Culture.

SAINT MARY'S RIVER, the channel connecting Lake Superior with Lake Huron, having more the character of a lake than a river. At Sault Ste. Marie, or St. Mary's Falls, there is a fall of 18 feet, and to enable vessels to avoid this canals have been made both in the United States and in Canada.

SAINT PAUL, the capital of Minnesota and Ramsey co., on the Mississippi, 10 miles below the Falls of St. Anthony. Owing to its favorable position it has grown in about 50 years from an insignificant depot into a fine city, and a great commercial and manufacturing center. It is surrounded by a complete



State capitol, St. Paul, Minn.

net of railways, and its situation on the Mississippi offers water communication of exceptional value. Two bridges connect the city with Minneapolis. Two double-track interurban electric street

car routes join the network in the two cities.

The city embraces an area of about 56 square miles. Of this area 1,204.42 acres, in 48 separate tracts, are devoted to park purposes. The park systems of the Twin Cities are connected by drives extending along the magnificent wooded gorge and the series of rapids below the Falls of Saint Anthony.

Saint Paul has numerous striking buildings. The finest is the new state capitol, of white Georgia marble, standing on a lofty eminence. It has a magnificent dome and entrances. The new post-office opposite Rice park, and the massive city hall and court house, occupying an entire square on Wabasha and Fourth streets, are other edifices of merit. Manufactures include agricultural machinery, joinery, railway rolling-stock, flour, leather, boots, and preserved provisions. There are medical and other colleges. Pop. 1909, 235,000.

ST. PETERSBURG. See Petersburg, (St.).

SAINT-PIERRE (san-pi-är), Jacques Henri Bernardin de, a French author, born 1737, died 1814. His *Etudes de la Nature*, published in 1783, first secured him a literary position. Then followed his chief works: *Paul et Virginie* (1787) and *Chaumière Indienne* (1790), both of them (especially the former) very popular. He was married twice when well advanced in years, each time to a young girl. In 1795 he was admitted to the Institute.

SAINTS, a word used in the New Testament as a general term to designate all believers in the gospel of Jesus Christ. In a specific sense it signifies persons whose lives have been deemed so eminently pious that the Greek and Roman Catholic churches have authorized practices of commemoration and invocation in regard to them. The points involved in the Roman Catholic doctrine are the intercession of the saints and the utility of invoking them. According to the Council of Trent "the saints reigning with Christ offer their prayers for men to God"; and it teaches that "it is good and useful to call upon them with supplication, and in order to obtain benefits from God through Jesus Christ, who alone is our Redeemer and Savior, to have recourse to their prayers, help, and aid." This help and aid is not expected to be given directly, but only through the favor the saints have with God, and through their intercession. As to how the saints are enabled to hear prayers addressed to them, there is no definite teaching. It is chiefly holy men who have died since the time of Christ that are spoken of as saints. The doctrine of saints, and the ideas and usages which grew out of them, form one of the main points of difference between the Protestants and the adherents of the above-mentioned churches. The Roman Catholics regard their beliefs on the subject of saints as supported by different parts of the Bible and the writings of many of the early fathers. Protestants generally object to the whole doctrine, alleging that not only is the idea of saints as intercessors nowhere contained in the Bible but that it originated centuries after the establishment of Chris-

tianity; and that it is against the chief doctrine of Christianity, which declares all men to be sinners, and to be saved only by Christ. Countries, cities, arts, trades, orders, things, etc., have their patron saints, or saints who are supposed to be specially interested on their behalf; but the church, it seems, determines nothing in relation to them. St. Denis is the patron of France; St. George of England and Russia; St. Andrew of Scotland; St. Patrick of Ireland; Olaf of Norway; Canute of Denmark; Nepomuk of Bohemia; Cecelia of music; Hubert of hunting; Crispin of shoemakers, etc.

SAINT-SIMON (saŋ-sē-mōn), Claude Henri, Comte de, founder of a philosophico-religious sect of socialists, was born at Paris in 1760. During the ten years 1803-13 he wrote a number of works on scientific and political subjects, in which may be traced the gradual development of his socialistic theories, which found more definite expression in his subsequent and more important writings, such as *L'Industrie ou Discussions Politiques, Morales et Philosophiques* (1817-18), and *Parabole* (1819). Augustin Thierry, Saint Aubin, and Auguste Comte, who had become his disciples, collaborated in these later volumes. Finding the difficulty of procuring the means of subsistence and of publishing his works increasing, he attempted suicide by shooting (1823), but recovered with a mutilated visage and the loss of an eye. He lived for about two years after this, dying in 1825.

SAINT-SIMONIANS. See Saint-Simon.

ST. THOMAS, a West Indian island, belonging to the kingdom of Denmark, one of the Virgin group, 36 miles east of Porto Rico. Area, 33 sq. miles; pop. 14,389; capital, Charlotte Amalia, on the south side, with a safe and commodious harbor, dock, fort, etc. It is neither fertile nor healthy, and is subject to droughts, cyclones, and earthquakes, but used to be an important center of West Indian trade.

ST. VINCENT, a British West Indian island, in the center of the Windward group. Area, 132 sq. miles; pop. about 41,000; capital, Kingstown, on a bay of the same name near the s.w. extremity of the island, with a pop. of 5593.

ST. VINCENT, Cape, a promontory forming the s.w. extremity of Portugal. It is celebrated in naval history for the great victory gained here in 1797 by the British admiral Sir John Jervis over a Spanish fleet nearly twice the strength of his own. Sir John was raised to the peerage under the title Earl of St. Vincent.

SAKI, the common name of several species of monkeys inhabiting South America, closely allied to the sapajous, but differing from the latter in having nonprehensile tails. They are roughly subdivided into long and short-tailed sakis. They are all forest-dwellers, gregarious, nocturnal, timid, and live chiefly on honey and fruits.

SALA, George Augustus, a journalist and author, born in London 1828. His last work was his own *Life and Adventures*. Much of his work was contributed to the (London) *Daily Telegraph*, but *All the Year Round*, the *Cornhill*

Magazine, and the *Illustrated London News* ("Echoes of the Week") contain many sparkling productions from his pen. He died in 1895.



Saki Cuxio.

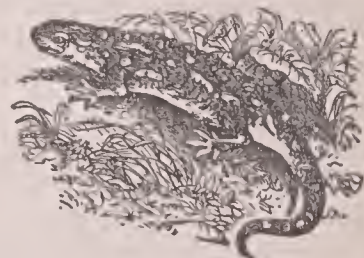
SAL'AD, a preparation of raw vegetables or herbs, such as lettuce, endive, red or white cabbages, celery, cresses, radishes, shalots, onions, green mustard, dandelion, corn-salad, etc.; or of cooked beet-root, potatoes, French beans, etc., with salt, vinegar, oil, sauces and spices. A great number of salads may be made by suitable combination of the materials mentioned, and still further variety is obtained by the admixture of different kinds of shredded meat, fish, eggs, sausage, lobster, crabs, prawns, shrimps, sardines, etc.

SAL'ADIN, or properly Salah-ed-din, a celebrated sultan of Egypt and Syria, born 1137, died 1193. His father, a native of Kurdistan, was governor of Tekrit (on the Tigris). He early distinguished himself as a soldier, became vizier to the last of the Fatimite caliphs in succession to his uncle Shirkuh, and on the caliph's death in Egypt (1171) Saladin usurped his wealth and authority, with the approval of Nureddin, the sultan of Damascus. After the latter's death (1173), Saladin succeeded also in possessing himself of Damascus and Southern Syria. He rapidly extended his conquests over Syria and the neighboring countries, and thus came in contact with the Crusaders during the Third Crusade. The disastrous defeat he suffered from the Crusaders in 1177 compelled him to return to Egypt, but in 1182 he resumed his career of conquest. In 1187 he gained the famous victory of Tiberias, and Jerusalem surrendered to him after a gallant resistance. But the fall of Acre in 1191 after a two years' siege, and the defeats at the hand of Richard I., compelled Saladin to conclude a truce (1192), which was followed by the withdrawal of Richard. About a year after this event Saladin died at Damascus.

SALAMAN'CA, a city in Spain, capital of a province of the same name, 120 miles northwest of Madrid, on and between three hills, and on the river Tormes, here spanned by a fine bridge of twenty-six arches, the greater part of which is of Roman origin. In picturesque, and in the magnificence of its ancient edifices, Salamanca is hardly surpassed by any other Spanish city. Chief among the numerous attractions rank the cathedral (16th century), a splendid example of florid Gothic; the old cathedral, erected 1102, in Romanesque style; the university, the College

of the Jesuits, King's college, and churches. The university is one of the oldest and most celebrated in Europe, and when at its zenith in the 16th century attracted some 15,000 students from all parts of Europe. Pop. 24,156.—The province of Salamanca, chiefly formed by the Douro basin, has an area of 4940 sq. miles, and a population of 320,765. It is rich in oak and chestnut forests and cereals, and produces wine, oil, and hemp.

SALAMAN'DER, the name given to various animals included in the class Amphibia (frogs, toads, newts, etc.), and in the order Urodela ("tailed") of that class. The salamanders may be divided into the land salamanders and the water salamanders, efts or newts. The land salamanders have an elongated lizard-like form, four feet, and a long tail. The skin is warty, with many glands secreting a watery fluid, which the animal exudes when alarmed. As this fluid is injurious to small animals the salamanders have the reputation of extreme venomousness, though they are in reality entirely harmless. The best-known species is the common salamander of Europe.



Common salamander.

It is 6 to 8 inches long, is found in moist places under stones or the roots of trees, near the borders of springs, in deep woods, etc., and passes its life in concealment except at night or during rain. It is sometimes called the spotted salamander, from the bright yellow stripes on its sides. There are various other species in Europe, Asia, and America. In America the name is often given to the menopome. Salamanders feed on worms, slugs, snails, and insects. The old legend that salamanders could live in the midst of fire is, like their venomousness, a fiction, although it is possible that the watery secretion of the skin might enable these animals to resist heat with impunity for a longer period than other forms.

SAL'AMIS, or **KOLURI**, an island of Greece, in the Gulf of Ægina, close to the shore of Attica. The celebrated battle, B.C. 480, in which the vast and unwieldy Persian fleet under Xerxes was signally defeated by a much smaller Grecian fleet, was fought here.

SAL-AMMONIAC, the chloride of ammonium, now generally obtained from the refuse of gas-works. It is used in calico-printing, in galvanizing iron, in soldering, etc.

SALEM, a city and seaport of Essex co., Massachusetts, about 14 miles n.e. of Boston. Its site is formed by two inlets of the sea; the North river, connected with Beverley by a bridge nearly 1500 feet long, and the South river, which forms the harbor. It has a large coasting trade and its manufac-

turing industries are in a flourishing condition, particularly in cotton, jute, leather and boots, spirits and chemicals. Pop. 38,940.

SALEM, a district and town of Hindustan, Madras presidency. Area of district, 7653, sq. miles; pop. 2,205,898.—Salem, the capital, is well situated in a long narrow valley traversed by the Tirumanimuttar, is clean and tolerably well built, and has a good trade and a weaving industry of some importance. Pop. 70,621.

SALERNO, a town and seaport of Italy, capital of the province of the same name, on the Gulf of Salerno, 30 miles southeast of Naples, finely situated on the side and at the foot of a hill, crowned by the remains of an ancient Norman citadel. Pop. 22,328.—The province has an area of 2126 sq. miles, and a pop. of 583,838.

SALFORD, a municipal, parl., and county borough of England, in Lancashire, which may be considered an integral portion of Manchester, though it has a mayor and corporation of its own. Pop. 220,956. See Manchester.

SALIC LAW, the code of laws of the Salian Franks. One of the laws in this code excluded women from inheriting certain lands, probably because certain military duties were connected with the holding of those lands. In the 14th century females were excluded from the throne of France by the application of this law to the succession to the crown, and it is in this sense that the term salic law is commonly used.

SALISBURY, Robert Arthur Talbot Gascoyne Cecil, K.G., Third Marquis of, English statesman, was born at Hatfield (county of Herts) in 1830, and educated at Eton and Oxford. As Lord Robert Cecil he entered parliament as member for Stamford in 1853, and gradually made his way till in 1866, on the formation of Lord Derby's third administration, he was appointed secretary of state for India. He became premier as well as foreign secretary on the fall of the Gladstone government in 1885. Gladstone succeeded again to



Marquis of Salisbury.

power in the end of the same year, but in June following was defeated on the Irish bills, when Lord Salisbury again became premier and foreign secretary, with the approval and support of the liberal unionists. This position he held till 1892, and in 1895 he entered on a third term as premier. In 1900 he became premier for the fourth time, but he retired from political life in 1902.

He died at Hatfield on August 22, 1903. He devoted much time to scientific pursuits.

SALIVA, the transparent watery fluid secreted by glands connected with the mouth. The quantity secreted in twenty-four hours varies, its average amount is probably from 1 to 3 pints. The purposes served by saliva are mechanical and chemical. It keeps the mouth in a due condition of moisture, and by mixing with the food during mastication it makes it a soft pulpy mass, such as may be easily swallowed. The chemical action of saliva on the food is to convert the starchy elements into some kind of sugar. The salivary glands are compound tubular glands known as the parotid, the sub-maxillary, and the sub-lingual, and numerous smaller bodies of similar structure, and with separate ducts, which are scattered thickly beneath the mucous membrane of the lips, cheeks, soft palate, and root of the tongue. Salivary glands are absent in some mammals and reptiles, and in most fishes.

SALIVATION, a superabundant secretion of saliva, either determined locally by the use of masticating irritants, or by means which act upon the whole system, especially by mercurial preparations. In the last case it is accompanied by a coppery taste, by swelling of the gums, and sometimes by looseness of the teeth. Salivation is usually diminished by the use of astringents, laxatives, etc.

SALIX. See Willow.

SALMON, a well-known fish, forming the type of the family Salmonidæ. The salmon inhabits both salt and fresh



The salmon-trout.

waters, and ranks prominent among the food-fishes of Britain and other countries. It generally attains a length of from 3 to 4 feet, and an average weight of from 12 to 30 lbs., but these limits of size and weight are frequently exceeded. The typical color of the adult fish is a steel-blue on the back and head, becoming lighter on the sides and belly. Teeth are present in the upper and lower jaws, palate, and vomer or roof of the mouth; the edges of the tongue are also toothed or notched. The food consists of animal matter, and must vary with the change of habitat from salt to fresh water, and vice versa. In the autumn the salmon quits the sea and ascends the rivers for the purpose of spawning, often having to surmount considerable obstacles, such as falls of some height, in its progress. In many streams they are now assisted in this by artificial structures known as "salmon-ladders," or the like. The eggs are deposited in a shallow trough or groove excavated in the gravelly bed of the river. After spawning, the salmon, both male and female, return to the sea under the name of spent-fish, foul-fish, or kelts, the females being further distinguished as shedders or baggits. In from 70 to

150 days the young fish emerges from the egg, and in its embryo state it is not unlike a tadpole, being on the average about one and a quarter inches in length. About 50 days later it assumes the appearance of a fish and now approaches the definite or parr stage of its existence, beginning to be marked by transverse bars of dark color. It usually continues in the shallows of its native stream for two years after hatching, and during this period it attains a length of 8 inches. When the season of its migration arrives, generally between March and June, the fins have become darker and the fish has assumed a silvery hue. It is now known as a smolt or salmon fry. The smolts now congregate into shoals and proceed leisurely seaward. On reaching the estuary they remain in its brackish water for a short time and then make for the open sea. Leaving its native river as a fish, weighing it may be not more than 2 ozs., the smolt, after three months' absence, may return to fresh water as a grilse, weighing 4 or 5 lbs. In the grilse stage or salmon peel, as it is sometimes called, the fish is capable of depositing eggs. After spawning in the fresh water the grilse again seeks the sea in the autumn, and when its second stay in the ocean is over it returns after a few months' absence as the adult salmon, weighing from 8 to 10 lbs. The salmon returns as a rule to the river in which it passed its earlier existence. The fertility of the fish is enormous: it has been calculated that over 150,000,000 of salmon ova are annually deposited in the Scotch river Tay alone, and of these only about a third come to life and attain the parr stage, while of these parrs only 20,000,000 become smolts; and in time only 100,000 remain as perfect salmon, of which 70,000 are caught and 30,000 left for breeding purposes. In Europe the fish is found between the latitudes of 45° and 75°, in North America in corresponding latitudes. The flesh of the salmon when fresh is of a bright orange color, and is of highest flavor when taken from the sea-feeding fish. Of the same genus as the common salmon is the salmon-trout, the common river-trout, Lochleven trout, etc. What is known as the "land-locked" salmon, which is found in Norway, Sweden, Maine, and New Brunswick, and is so called because it remains in inland waters and does not descend to the sea, is by some regarded as a distinct species from the common salmon, by others not. In the waters of Northwestern America are several salmon belonging to a distinct genus, including the quinnat or king-salmon, blue-back salmon or red-fish, silver salmon, dog salmon, and hump-back salmon. The quinnat has an average weight of 22 lbs., but sometimes reaches 100 lbs. Both it and the blue-back salmon are caught in immense numbers in the Columbia, Sacramento, and Frazer (especially in spring), and are preserved by canning. Attempts have been made to introduce the quinnat into eastern North America and Europe. The flesh of these salmon is indistinguishable from that of the common form. The salmon is one of the fishes that are important objects of pisciculture, and various species

of the family have been introduced into waters not previously inhabited by them.

SALMON-FISHING. Law of. See Poaching.

SALMONIDÆ, a family of teleostean fishes, belonging to the subdivision Malacopteri of that order. To this family belong the various species of salmon (see Salmon), the trouts, the char, the grayling, the smelt, the vendace, whitefish of America, etc. The Salmonidæ are abdominal Malacopteri, in that their ventral fins are placed backward on the belly. The body is covered with cycloid scales; the head is naked, and there are no barbels. The belly is rounded, and there is a small adipose fin behind the dorsal. Pyloric appendages of the stomach are generally numerous and rarely absent. The air-bladder is large and simple. The ova fall into the cavity of the abdomen before exclusion. Salmonidæ are inhabitants of the sea or fresh-water, or both.

SALONICA (ancient, Thessalonica; Turkish, Saloniki), a large seaport of Turkey in Europe, on a gulf of the Ægean sea, 315 miles w.s.w. of Constantinople, rising from the sea in the form of an amphitheater, and forming a mixture of squalor and splendor. St. Paul preached the gospel here, and addressed two of his epistles to the Christian converts. Railways run to Vienna and Constantinople. Pop. 150,000, half being Jews and Greeks.

SALSETTE', a large island to the north of Bombay, and connected with Bombay island by bridge and causeway; area, 241 sq. miles. The coast abounds in cocoa-nut groves, and the palmyra-palm grows plentifully over most of the island. The island is remarkable for its cave architecture. Pop. 108,149.

SALT, in chemistry. It is impossible to state in very precise terms what is the idea attached to the word salt, as at present used in chemical science. It may perhaps be most correctly defined by saying that it implies the capability of readily undergoing double decomposition. In its most restricted significance the word salt suggests a substance, which, if soluble in water, can produce rapid double decompositions with other soluble substances, or if insoluble, can be produced as a precipitate, as the result of a rapid double decomposition taking place between soluble substances. This is certainly the idea suggested by the application of the word salt to nitrate of potassium, chloride of sodium, etc. The term salt is also sometimes applied to substances which, like chloride of ethyl, give rise to slow processes of double decomposition with aqueous solutions of the salts specially so called. The name is, however, most commonly and most appropriately applied to those bodies of which reaction by double decomposition is the most characteristic property, and which exhibit such reactions under the most familiar conditions.

SALT, Common (chloride of sodium, NaCl), a substance in common use as a seasoner and preserver of food from the earliest stages. It exists in immense quantities dissolved in sea-water, and

also in the waters of salt springs, and in solid deposits, sometimes on the surface, sometimes at greater or less depths, in almost every geological series. Rock-salt, that is salt in the crystalline or solid form, is found in great abundance in Cheshire, Yorkshire, and Worcestershire. It is also found in abundance in nearly every country of Europe. The supply in other continents is equally great. The basin of the Indus and other parts of India possess extensive salt plains. In China deep salt-wells abound. The Sahara and Central and Southern Africa afford inexhaustible supplies. Most of the South American republics, the West Indies, and the United States also have large natural supplies. Salt manufactured from sea-water is produced extensively along the Mediterranean and Atlantic sea-boards of Europe as well as in America. It is chiefly made by natural drying in shallow reservoirs, but also by boiling. Sundried salt is the purest. Salt from sea-water is usually known as bay-salt. Most salt, however, is produced from rock-salt or from brine springs, the latter being due to the melting of rock-salt by water. Salt was subject to a duty in ancient Rome, and this example has been generally followed in modern states. One of the most oppressive of the salt taxes in Europe was the French gabelle. In Great Britain salt-duties were imposed in the reign of William III., but the tax was abolished in 1823. In British India salt is an important source of revenue. Salt is used as a glaze for coarse pottery, as a mordant, for giving hardness to soaps, for improving the clearness of glass; it is the source of soda and of chlorine, and is thus of immense industrial importance.

SALT LAKE, Great. See Great Salt Lake.

SALT LAKE CITY, the capital of the state of Utah, 2 miles from the Jordan, and 11 miles from Great Salt Lake. It stands at the base of Wasatch mountains 4550 feet above sea-level. The streets are wide, and the dwellings generally small and of one story. The most remarkable public buildings are the Mormon tabernacle, a large ungainly building with a roof like a dish-cover, the Mormon temple, and the city-hall. It is the metropolis of the Mormons, and was first settled in 1847 by the followers of Brigham Young. Pop. 100,000.

SALTS, Smelling, a preparation of carbonate of ammonia with some agreeable scent, as lavender or bergamot, used by ladies as a stimulant and restorative in fits of faintness.

SALVADOR', a republic in Central America, lies along the coast of the Pacific, and is bounded by Honduras on the north and east, and by Guatemala on the northwest; area, 7212 sq. miles. A range of volcanic peaks, varying in height from 4000 to 9000 feet, runs through the center of the country, dividing an interior valley from the lowlands on the coast. The largest river is the Lempe, which is only navigable in parts. The soil is remarkably fertile. The most important crop is indigo, which is of excellent quality. Corn, sugar, coffee, tobacco, cotton, etc., also thrive well. Cattle-breeding is carried

on, but not extensively. The manufactures are unimportant. The chief exports are coffee, indigo, silver, raw sugar, balsam of Peru, leather, etc. They are of the annual value of about \$400,000,000. The population consists of a small number of whites (of Spanish descent), Spanish-speaking Indians, and half-breeds. The established religion is Roman Catholicism. The government is carried on by a president and four ministers. There is a congress of seventy deputies elected by universal suffrage. The inhabitants had long the reputation of being the most industrious in Central America, and the state, in proportion to its size, is still the most densely peopled. Pop. 803,534. Salvador remained under Spanish rule until 1821, when it asserted its independence, and joined the Mexican confederation. In 1823, however, it seceded from the confederation, and subsequently formed part of the republic of Central America. In 1853 it became an independent republic. Its progress has been much hindered by internal dissensions, revolutions and counter-revolutions following each other without end. The capital is San Salvador.

SALVAGE, a recompense allowed by law to anyone, by whose voluntary exertions ships or goods have been saved from the dangers of the sea, fire, pirates, or enemies.

SALVATION ARMY, a religious organization originated in East London by William Booth, the leader and general, in 1865. The society was developed into its present form and received its name in 1878. Latterly several agencies more directly philanthropic have been grafted on it for helping the needy and outcast. With the name army came military phraseology. A semi-military attire was assumed, barracks were built, and the army marches out with banners displayed and bands of music. Music (drums, cornets, etc.) is also employed in the meetings, and other proceedings of a sensational character. The object is to attract people who would not enter church or chapel, and for this cause public-houses, prisons, etc., are visited and open-air meetings are held. The weekly journal of the army is the War Cry. As a temperance movement the Salvation Army has been the means of converting hundreds of thousands of confirmed drunkards. Total abstinence is a condition of membership. The International headquarters are at London, England. Its world-wide operations are carried on in 51 countries and colonies, embracing 7316 posts, under the charge of 20,054 officers and employes, with 45,339 local officers, 17,099 brass bandmen, and about 50,000 musicians. Sixty-three periodicals are published in 24 languages, with a weekly circulation of about 1,207,223. There are 668 Social Relief Institutions in the world, under the charge of nearly 3,000 officers and employes. The headquarters of the Salvation army in America are in New York City.

SALVINI, Tommaso, Italian tragedian was born at Milan in 1829. After winning renown in juvenile characters he joined the Ristori troupe. He appeared

in the Edipo of Niccolini and achieved a great success. Alfieri's Saul was perhaps the greatest of all his characters. His first appearance in the United States was in 1873, and he was so well received that he repeatedly returned. In 1886 he and Edwin Booth played together for three weeks, Salvini as Othello and Booth as Iago. After Salvini's last tour in this country in 1890 he retired from the stage to his home in Florence. Died, 1896.

SAL VOLATILE (vo-lat'i-lē), carbonate of ammonia. The name is also applied to a spirituous solution of carbonate of ammonia flavored with aromatics.

SALZBURG (sälts'burh), a city of Austria, capital of the Duchy (or province) of Salzburg, is most picturesquely situated on both banks of the rapid Salza, which is here hemmed in between two isolated hills, 63 miles southeast of Munich. The manufactures are varied, but not individually of importance. Pop. 32,934.—The Duchy or crown-land of Salzburg, area 2767 sq. miles, is a rugged mountainous country, intersected by numerous valleys, chiefly pastoral, but in many of them much corn and fruit are raised. Wood is abundant, and the minerals, which are very valuable, include gold, silver, lead, copper, cobalt, iron, salt, and marble. Pop. 193,247.

SAMAR', one of the Philippine Isles, separated by channels from Luzon to the north, and Leyte to the south. Area, 5000 sq. miles. The island is densely wooded and the soil fertile. The chief products are rice, cocoa, palm-oil, hemp, and timber. Pop. 194,027.

SAMA'RA, a town of Russia, capital of the government of same name, 550 miles e.s.e. of Moscow, at the confluence of the Samara with the Volga. Pop. 96,085.—The government lies on the left bank of the Volga, and has an area of 64,985 sq. miles. A great part is flat and fertile, but is at present little cultivated. There is little wood. Wheat and other kinds of grain are the chief products. There are a considerable number of Swiss and German colonists here, also Nogai Tartars, Bashkirs, and Kirghis. Pop. 2,650,580.

SAMARANG', town of Java, on the north coast of the island, near the mouth of the Samarang river. Next to Batavia and Surabaya it ranks as the most important commercial port of Java. Its harbor is not good, and large ships have to anchor at some distance from the shore. Pop. 83,000.

SAMARIA, an ancient town of Palestine, formerly capital of the Kingdom of Israel, finely situated on a hill surrounded by higher hills, 36 miles n.n.w. of Jerusalem. Samaria was built by Omri, king of Israel, about B.C. 925, and was the metropolis of the ten tribes till they were carried away into captivity about B.C. 720. After its destruction by John Hyrcanus it was rebuilt, and given by Augustus to Herod, who gave it the name of Sebaste. There is now an insignificant village here and some striking ruins.

SAMARITAN PENTATEUCH, an ancient version of the five books of Moses which has been preserved by the Samari-

tans as the canonical Scriptures have been by the Jews.

SAMARITANS, a mixed people, who inhabited the region between Judæa and Galilee, and who formed a sect among the Jews. They consisted partly of the tribes of Ephraim and Manasseh left in Samaria by the king of Assyria, when he had carried their brethren away captive, and partly of Assyrian colonists. On the return of the Jews from captivity they declined to mix with the Samaritans, though united with them in religion. The latter attempted to prevent the Jews from building the temple at Jerusalem, and, failing in this, they built a temple on Mount Gerizim exclusively for their own worship. A few of the race still exist at Nablus. They adhere strictly to the Mosaic law, but are regarded by the Jews as heretics, as they accept only the Pentateuch, of which they have a special version of their own. They believe in angels, in a resurrection and future retribution, and expect the coming of a Messiah, in whom they look only for a prophet. In the synagogue the Aramaic Samaritan dialect is used, but they speak Arabic. They avoid connection with other sects, and marry only among themselves.

SAMARKAND', a city of Asiatic Russia, on the Zerafshan river, 130 miles e. of Bokhara, situated in a fertile plain. It contains 80 schools with about 1500 pupils. Pop. 54,900. See Bokhara.

SAMIAN WARE, a name given to an ancient kind of Greek pottery made of Samian earth, or to a variety of Roman pottery made in imitation of this. The vases are of a bright red or black color, covered with a lustrous siliceous glaze, with separately-moulded ornaments attached to them.

SAMNITES (-nītz), an ancient people of Lower Italy, who were of Sabine stock, and consisted of several tribes. They were a brave, frugal, and religious people. Their first war with the Romans resulted in favor of the latter, and secured a Samnite alliance during the Latin war (340-338 B.C.). The second Samnite war (326-304 B.C.) was a fierce contest, in which the Romans were shamefully defeated at the Caudine Forks, but were finally successful.

SAMO'A, or **NAVIGATOR ISLES**, a group of volcanic islands in the South Pacific, n.e. of the Fiji group, made up of three large islands, Upolu, Savaii, and Tutuila; and a number of smaller ones; total area about 1700 sq. miles, with a population of nearly 37,000. The most important island of the group is Upolu, with an area of 340 sq. miles, diversified by mountains and fertile plains; pop. about 17,000. Apia, the seat of government, is a town of 1500 inhabitants situated on a bay on the n.w. side of Upolu. Savaii, the largest of the group, has an area of 659 sq. miles, and is extremely mountainous (greatest height 5350 feet), the interior being hardly known. Tutuila has an area of 54 sq. miles. The government of Samoa is a limited monarchy presided over by a king and a vice-king, with a parliament of chiefs called the malo. The Samoans are of Polynesian extraction, and vary in color from a dark brown to a light copper, occasionally to a shade of olive.

They are of fine physique and of a gentle disposition, and are now all Christians. Their language contains thirteen letters, and is soft and liquid. The leading industries are fishing, collecting copra, the cultivation of fruit, cotton, and taro, and the manufacture of tapa, a native cloth. The cocoa-nut, bread-fruit tree, taro, and banana form the staple food of the people. From 1889 till 1899 the islands were under the joint control of Germany, Britain, and the United States, but in 1899 an agreement was arrived at under which Britain withdrew entirely, while Germany received Upolu and Savaii, the United States obtaining Tutuila and other islands.

SAMOS, now Samo, an island in the Grecian archipelago near the coast of Asia Minor, 45 miles southwest of Smyrna, forming a principality tributary to Turkey, area, 180 sq. miles. In 84 B.C. it was united with the Roman province of Asia. In 1550 it was conquered by the Turks. It now occupies an exceptional position, having been erected into a tributary principality of the Sublime Porte in 1832, the ruler being a Greek prince. Pop. 55,000.

SAM'OTHRACE, or **SAMOTHRAKI**, an island in the n. of the Ægean sea, belonging to Turkey, about 14 miles long by 8 miles broad.

SAMOVAR', a Russian tea apparatus, the water in which is boiled by means of



Antique Russian samovar.

hot coals contained in an iron tube, and then poured over the tea.

SAM'PAN', a boat of various build used on the Chinese rivers, at Singapore



Sampan, Canton river.

and elsewhere, for the conveyance of merchandise, and also frequently for

habitation. They are swift sailers both with oar and sail.

SAMPSON, William Thomas, American naval officer, was born at Palmyra, New York, in 1840. In June, 1864, he became executive officer of the iron clad Patapsco of the Charleston blockading squadron. From 1879 to 1882 he commanded the Swatara on the Asiatic station. In 1890 he was assigned to the command of the San Francisco, the first modern steel cruiser of the new navy. From January, 1893, until May, 1897, he was chief of the bureau of ordnance. He was appointed president of the naval court of inquiry to investigate the blowing up of the battleship Maine in the harbor of Havana and shortly afterward he was appointed as acting rear-admiral, to the command of the North Atlantic squadron. He attained the rank of commodore in regular line of promotion on July 3, 1898. When Admiral Cervera's Spanish squadron was destroyed Sampson himself was absent until the battle was practically over, but it was fought on lines laid down by him. After the war he served as a Cuban commissioner, was promoted rear-admiral on March 3, 1899, and until September, 1901, was in command of the Boston (Charlestown) Navy Yard. He was retired from active service February 9, 1902. He died in 1902.

SAMSON, an Israelite of the Tribe of Dan, the son of Manoah, reckoned one of the judges of Israel, a popular hero, and an inveterate enemy of the Philistines, flourished about 1116-1096 B.C. His peculiar gift of great bodily strength is strikingly shown in the nature of his deeds, as tearing in pieces a lion, breaking his bonds asunder, carrying away the gates of Gaza, and throwing down the pillars of the house of Dagon. Previous to the latter event Delilah, his concubine, deprived him of his strength for a period by cutting off his hair, which was a violation of his obligation as a Nazarite, but with the growth of his hair his strength returned, and at the great festival of Dagon Samson pulled down the building over the heads of the Philistines, who had blinded him, he himself perishing with them. Milton has made his death the subject of a drama—Samson Agonistes.

SAMUEL, the first of the order of prophets and the last of the judges of Israel. He was the son of Elkanah of Ramathaimzophim, belonging to the tribe of Levi, and was consecrated by Hannah, his mother, to the service of Jehovah. He was educated in the house of the chief priest Eli at Shiloh, and had the disasters revealed to him that should befall the house of Eli. He assumed the judgeship of Israel about twenty years after the death of Eli, and headed a successful expedition against the Philistines. He mentions his own name in the list of warlike chiefs by whom the Lord sent deliverance to his people, and it is recorded that he judged Israel as civil ruler all his life, going a yearly circuit from Ramah, where was his home, to Bethel, Gilgal, and Mizpeh. His administration was distinguished by the restoration of the neglected worship of Jehovah. He also gave a new vigor to

the theocratical institutions of Moses by the establishment of schools of the prophets. In his old age Samuel anointed Saul as king, and when Saul failed in his duties Samuel anointed a new king, David. He did not live to see the contest between David and Saul decided.

SAMUEL, Books of, in the Old Testament, are two in number in the modern editions of the Hebrew text. In Hebrew MSS. the work is one; the division into two books, being first introduced by Bomberg, in 1518, at Venice. The contents of the books present us with a more or less consecutive narrative of events relating to the Israelites, from the priesthood of Eli to the death of David. The principal periods embraced in the record are: the restoration of the theocracy under Samuel (book i. chap. i.-xii. B.C. 1171-1095); the history of Saul's reign, ending with his death (book i. chaps. xiii.-xxxi. B.C. 1095-55); and the history of David's reign (book ii. B.C. 1055-15). As regards the authorship of these books it is evident they could not have been written by Samuel, since his death is recorded in book i. chap. xxv.

SAN ANTONIO, or **SAN ANTONIO DE BEXAR**, a town on the San Antonio river, 80 miles southwest of Austin City, Tex. The principal public buildings are the hospital, orphan asylum, a Roman Catholic cathedral college and convent, arsenal, and schools. The town is a great center of trade in wool, horses and mules, hides, and grain. There are several breweries, tanneries, and flour mills. It is one of the oldest Spanish towns on the continent, and has a large trade with Mexico. Pop. 1909, 100,000.

SAND, fine particles of stone, particularly of siliceous stone in a loose state, but not reduced to powder or dust; a collection of siliceous granules not coherent when wet. Most of the sands which we observe are the ruins of disintegrated rocks, and differ in color according to the rocks from which they were derived. Valuable metallic ores, as those of gold, platinum, tin, copper, iron, titanium, often occur in the form of sand or mixed with that substance. Pure siliceous sands are very valuable for the manufacture of glass, for making mortar, filters, ameliorating dense clay soils, for making moulds in founding, and many other purposes.

SAND, George. See Dudevant.

SANDAL, a kind of shoe or covering for the feet used among the ancient Jews, Greeks, and Romans. It con-



Sandals.
The pair in the middle are Roman, those on the sides are Greek.

sisted of a sole fastened to the foot by means of straps crossed over and wound round the ankle. Originally made of wood, vegetable leaves or fibers, or

leather, they afterward became articles of great luxury, being made of gold, silver, and other precious materials, and beautifully ornamented. Certain religious orders of the present day wear sandals.

SANDALWOOD, a tree belonging to the East Indies and the Malayan and Polynesian islands, remarkable for its fragrance. Its wood is used as a perfume, and is manufactured into glove-boxes and other light articles. It is largely used as incense in the worship of Brahmams and Buddhists. There are several species which furnish sandalwood, the common being *S. album*. Some trees of other genera are called false sandalwood. See also *Adenanthera*.

SANDALWOOD ISLAND, or **JEEN-DANA**, a large island in the Indian archipelago belonging to the Dutch residency of Timor, crossed by the meridian of 120°E.; area, 4000 sq. miles; with a population of about 2,300,000. The coast is bold, and terminates at the



Sandalwood.

southern extremity in a lofty and inaccessible peninsula. The interior is mountainous. Edible birds' nests, beeswax, ponies, and sandalwood are obtained here. The natives are of the Malay race.

SANDARACH (san'da-rak), a resin which exudes from the bark of the sandarach tree. It is used as incense, and for making a pale varnish. It is also used as pounce powder for strewing over paper erasures. Called also Juniper-resin.

SANDARACH TREE, a large coniferous tree with straggling branches, yielding the resin described in preceding article. It is a native of Morocco, Algeria, and Northern Africa generally. The timber is fragrant, hard, and durable, and is largely used in the construction of mosques and other buildings, as well as for cabinet work.

SAND CRAB, or **RACING CRAB**, a genus of crabs, which live in holes in the sand along the seashores of warm countries, inhabits the Mediterranean, Red sea, and Indian ocean, and is remarkable for the rapidity of its motions.

SAND EEL, a genus of fishes. The body is slender and cylindrical, somewhat resembling that of an eel, and varying from 4 inches to about 1 foot in length, of a beautiful silvery luster, destitute of ventral fins, and the scales hardly perceptible.

SANDERLING, a wading bird averaging from 6 to 8 inches in length, which

SAN DIEGO

breeds in the Arctic regions, and in winter migrates southward. It feeds on small marine animals, and chiefly inhabits the sandy tracts of the sea-beach and the estuaries of rivers. The flesh is nutritious and pleasant to the taste.

SAN DIEGO (sân dē-ā'gō), a port of entry and the county seat of San Diego co., Cal., 125 miles south by east of Los Angeles, on San Diego bay, and on the Atchison, Topeka and Santa Fe railroad, and several steamship lines. It is a favorite health resort, has a beautiful situation and a mild and equable climate. Coronado Beach with its large hotel, ostrich farm, botanical gardens and other attractions lies across the bay. The navy and the war department have separately large tracts of land on the bay, for a coaling station and fortifications respectively, the latter known as Fort Rosecrans. Pop. 1909, 45,000.

SAND FLIES, the name of certain flies found in various countries, the bite of which may give rise to painful swellings. They are included in the family Tipulidæ, which also includes the well-known "daddy long-legs" or crane-flies.

SAND GROUSE, a genus of rasorial or scratching birds, belonging to the family Pteroclidæ, and differing in several respects from the common grouse (which see), belonging to the family Tetraonidæ. They are natives chiefly of the warm parts of Asia and Africa, and are most abundant in arid sandy plains. The legs are longer than in other grouse, and the tail and wings are pointed. Pallas's sand grouse differs from these in having feathered tarsi and united toes. It is a native of the sandy plains of Central Asia, where it occurs in vast numbers.

SAND HOPPER, a species of small insect-like crustaceans of the order Amphipoda, common along most seashores, where they may be met with leaping about the sands in great quantities after the receding tide.

SANDHURST, a flourishing city of Victoria, Australia, about 100 miles n.n.w. of Melbourne, an important railway and gold mining center. It contains a handsome pile of public buildings, fine townhall, law courts, banks, hospital, benevolent asylum, mechanic's institute (with a library of 14,500 volumes), a theater, numerous places of worship, botanic gardens, etc. It is lighted with gas and electricity, and well supplied with water. Besides gold mining, which employs 4000-5000 miners, iron founding and making of railway rolling stock, coach building, stone cutting, tanning, vine growing, etc., are carried on. Pop. 50,000.

SAND MARTIN, or **BANK MARTIN**, a bird included in the family of swallows a summer visitant to Britain, where it is common in most localities. It is the smallest British member of its family, and is so named from its habits of nest-building in holes dug in the high banks of rivers, in the sides of sand or gravel pits, and in similar situations. The color of the sand-martin is a soft brown on the head and upper parts, and white below, with a dark brown band on the chest.

SAN DOMINGO (more properly Santo Domingo), the capital city of the Do-

minican republic, which includes the eastern part of the island of Hayti. The town is situated at the mouth of the Ozama on the south coast, and is the seat of the government and a bishop's see. It has spacious streets and squares, a cathedral dating from 1540, a university, etc. San Domingo is the oldest European city of the New World, and was founded by Bartholomew Columbus in 1496. Columbus was buried here in 1536; but his remains were removed to Havana in 1794. Pop. about 16,000.

SANDPAPER is made in the same way as emery-paper, with the difference that sand is substituted for emery. See Emery.

SANDPIPERS, a group of small grallatorial or wading birds, belonging to the family Scolopacidæ or snipes. These birds inhabit the shores of the sea and the estuaries and banks of rivers, and grope in the soft mud for the worms, small molluscs, insects, etc., upon which



The broad-billed sandpiper.

they feed. They migrate southward in winter in flocks, and appear to moult twice a year, the summer plumage differing from the winter dress. The voice is shrill and unmusical; and they are able both to run and to fly with rapidity. Sandpipers of various species are abundant in North America, and in winter in the West Indies.

SANDSTONES consist usually of grains of quartz aggregated into a compact rock, which may also contain particles of felspar, minute scales of mica, and an admixture of clay, indicating in many places their immediate derivation from the debris of granitic rocks. Sandstones are in most cases chiefly composed of particles of quartz, united by a cement. The cement is in variable quantity, and may be calcareous or marly, argillaceous or argillo-ferruginous, or even siliceous. The grains of quartz are sometimes scarcely distinguishable by the naked eye, and sometimes are equal in size to a nut or an egg, as in those sandstones called conglomerates, or sometimes pudding-stone or breccia. The texture of some sandstones is very close, while in others it is very loose and porous. Some sandstones have a fissile structure, and have been called sandstone slate. In color sandstone varies from gray to reddish-brown, in some cases uniform, in other variegated. In addition to quartz some sandstones contain grains of felspar, flint, and siliceous slate, or plates of mica. Some sandstones are ferruginous, containing an oxide or the carbonate of iron. Sandstones have been formed at different periods and under different circumstances, and are hence associated with different rocks or formations. They are

SAN FRANCISCO

in general distinctly stratified, and the beds horizontally arranged, but sometimes they are much inclined or even vertical. Sandstone in some of its varieties is very useful in the arts, and when it has no tendency to split is known by the name of freestone. When sufficiently solid it is employed as a building stone. Some varieties are used as millstones for grinding meal, or for wearing down other materials preparatory to a polish, and some are used for whetstones.

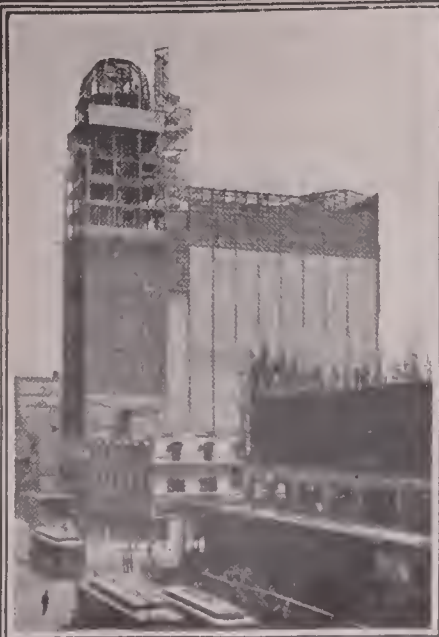
SANDUSKY, a city of Ohio, on a sandstone ridge on the southern side of Sandusky bay, Lake Erie, about 61 miles w. of Cleveland. The site rises gradually from the shore and commands a fine view of the bay. The principal public buildings are a courthouse, a high school, and many churches. An extensive trade is done in fish, lumber, limestone, manufactured woodwork, grapes, and wine; and there are large machine shops, steel works, and engine and boiler works. It is celebrated for its manufacture of articles in bent wood; and its fisheries employ over 1000 hands. Pop. 23,764.

SANDWICH ISLANDS, a cluster of islands, thirteen in number, situated in the North Pacific, area, 647 square miles; pop. 31,194. Honolulu, the capital and chief port of the islands, is situated on Oahu. The remaining large islands are Kauai and Niihau, with an area of 657 square miles, and 11,859 inhabitants. The island of Molokai is a leper colony. The inhabitants of the group belong to the light-colored Oceanic stock, and have been civilized and converted to Christianity. After forming a republic for a short time, the monarchy having been overthrown in 1893, these islands now belong to the United States, having been annexed in 1898. The republican legislature consisted of a senate of fifteen members, and a chamber of representatives of fifteen members. The head of the government was a president, elected for six years by the two houses voting together, and he was assisted by a council of state. Honolulu, the capital, has become an important entrepot, and in it almost the whole trade of the islands is centered. The chief exports are sugar, rice, coffee, bananas, tallow, and hides; the imports are chiefly manufactured goods, provisions, grain, and timber. The currency is that of the United States. The islands were discovered by Cook in 1778, who afterward lost his life on Hawaii. Pop. 154,001. In 1900 the islands were constituted as the Territory of Hawaii. See Hawaii.

SANDY HOOK, a low sandy peninsula at the entrance of New York harbor.

SAN FRANCISCO, the largest city on the Pacific coast of the United States, almost totally destroyed by earthquake and fire on April 18-21, 1906. San Francisco was founded on October 9, 1776, by two Franciscan monks, Palon and Cambon, who established an Indian mission and called it San Francisco de Asisi. The place remained a mission until 1822, when California passed under the control of Mexico. Then a village gradually was established, called Dolores. In 1836 a small trading village called Yerba Buena was established three

HOW SAN FRANCISCO HAS RAISED ITS FALLEN HEAD. THE REBUILDING OF EARTHQUAKE SHAKEN TOWNS



Humboldt Savings Bank



A Seventeen-story-high Building



Twelve Stories Built in Eight Months



Montgomery Street, One of the Chief Thoroughfares



The Skeleton Waiting for Its Skin of Stone



BUILDERS OR CARTS ARE THE PRINCIPAL VEHICLES TO BE SEEN IN THE STREETS

miles northeast of Dolores, in the bay. In 1846, when the United States took possession, Yerba Buena had a population of 450, and in that year the village dropped its new name and took that of the mission, San Francisco. The discovery of gold in 1848 brought thousands of men to the Pacific coast. In March, 1848, the population of San Francisco was 800. In September



1849, it was 10,000. From that year the city grew rapidly. In 1860 it was 56,802; in 1870, 149,473; in 1880, 233,959; in 1890, 293,997; in 1909, 400,000. In 1906 the city covered an area of



Comparative area of three great fires.

47 square miles, with 750 miles of streets, 20 miles of boulevards, 275 miles of street railway, 4,000 stone, brick, and steel buildings, 55,000 frame buildings, three museums and art galleries, eight public libraries, 47 hospitals, 93 public schools, and many hotels, theatres, opera houses, and clubs.

The city was almost completely

destroyed by earthquake and fire on April 18, 19, and 20, 1906. Five times before had the city been visited by fire—on Dec. 14, 1849; May 4, 1850; June 14, 1850; May 2, 1851, and June 2, 1851. These five fires destroyed \$16,000,000 worth of property. The great disaster, however, came at 5:13 o'clock on the morning of April 18, 1906, when three violent shocks of earthquake leveled many buildings, opened great fissures in the streets, and shut off the water supply by breaking the mains leading to the great reservoirs. Almost immediately fires started in a hundred different parts of the city. There was no water with which to fight the flames. Hundreds of buildings were blown up with dynamite and shot to pieces with artillery, but for three days the fire ravaged almost unchecked. In those three days an area of fifteen square miles, or approximately 10,000 acres, was burned. The burnt district included nearly two-thirds of the residence portion, thousands of mercantile and manufacturing establishments, 100 banks and financial institutions, all of the theatres, opera houses, hotels, public libraries, hospitals, and churches, and most of the public school buildings. More than 200,000 persons were left homeless and penniless. Three hundred and seventy-nine persons were killed or died of injuries and exposure.

Among the notable buildings destroyed by earthquake and fire were the Palace Hotel, the City Hall, which cost \$6,000,000, and required 25 years to build; the famous residences of Nob Hill, the Call, Chronicle, and Examiner buildings, and the Flood, Mills, and Spreckles buildings. The disaster proved that the modern steel "skyscraper" can safely defy even violent earthquake shocks, for the steel structures in San Francisco stood, while massive stone and brick buildings of the old-fashioned construction were razed to the ground. United States and state troops took possession of the ruined city. The federal soldiers took charge of the hospital and relief work, established refugee camps, and put down lawlessness with an iron hand. Scores of thieves were shot down. The most drastic steps were taken to prevent a recurrence of the conflagration. Even in the houses untouched by the flames no lights or fires were permitted until after the water supply and fire protection had been restored. Every householder, millionaire, and mechanic alike was compelled to cook all meals in the street.

The nation was quick to respond to the cry of the homeless and hungry. Congress appropriated \$2,500,000. All the cities raised huge sums. Carloads of provisions and clothing were hurried into the city, and in two days all danger of famine had passed. The property loss was estimated at \$200,000,000, of which approximately three-fourths was covered by insurance. The city is being rapidly rebuilt on a more extensive scale and the new city will be one of the most modern on the continent.

SANGIR ISLANDS (sanger), a group of small islands in the Indian Archipelago, situated between the n.e. extremity

of Celebes and the Philippine isle of Mindanao. The natives are of the Malay race, and profess Christianity. The islands belong to the Netherlands. Pop. about 50,000.

SAN'HEDRIM, or San'hedrin (corrupted from the Greek sunedrion, a council), the supreme judicial tribunal of the Jews, existing in the time of the Maccabees and in New Testament times. According to the Talmud it was founded by Moses when he elected seventy elders to assist him in judging the children of Israel in the wilderness, but this view is now generally rejected. The sanhedrim consisted of seventy members besides the president, who was usually the high priest. They were chosen from among the priests, elders, heads of families, and scribes or doctors of law, and had power to deal with both secular and spiritual matters. At the trial of our Lord they sat in the palace of the high priest. The council became extinct in 425.

SANITARY SCIENCE teaches how to maintain health and to ward off disease, and treats more especially of what is required of each individual in his duty to his neighbor, so that by using such means as may ensure his own health he may in a negative way preserve that of his neighbor also. The subject naturally divides itself into four main divisions: 1. That relating to our dwellings; 2. Food; 3. Clothing; 4. Cleanliness. As regards the first head, our dwellings should be situated so as to ensure a free circulation of air round them, and a thorough system of drainage. The rooms should be large, airy, and well ventilated. A most pernicious source of impurity is sewer-gas, which can only enter houses where waste and soil-pipes are in direct communication with the main system of sewers. The decomposition of fecal and other matters in drains produces both ammoniacal and other sulphurous gases. These gases, owing to their light specific gravity, rise to the highest point in the pipes, and from thence force their way through imperfections in drains and pipes, and also through the water-traps of closets, sinks, etc., into our houses, and become a most potent atmospheric impurity. They are of two kinds—an odoriferous and an odorless gas. The former is almost innocuous, but the latter is most deadly, since it depresses the general system and frequently contains the germs of disease. Sunlight and thorough ventilation destroy the properties of this gas. In order to prevent sewer-gas from entering a house, all waste-pipes in connection with the sewers should be carried along outside the house and furnished with a ventilator, so that the gas may escape into the external air. The ventilator should discharge at the roof of the house, and not near to a window or other opening into the dwelling. The outlet of pipes from wash-basins in bed-rooms should discharge in the open air, and should not be directly connected with drains. Foul smells and gases arise from many other causes, such as decomposition of organic matter within the house, emanations from the surface of the body, preparations of arsenic and copper in wall-paper etc. Flowers also give off carbonic acid

gas at night, and gas-jets also pour much impurity into the atmosphere. Overcrowding also greatly vitiates the atmosphere. Thorough drainage of our houses is also very necessary in order to prevent dampness, which is a most prolific source of disease. Every portion of a house should be kept scrupulously clean and after infectious or contagious disease there should be a thorough cleansing and disinfecting of the furniture, bedding, carpets, etc. The neglect of an efficient use of cold water is perhaps one of the most potent and prolific causes of disease. The first duty of every human being is to attend thoroughly to the cleansing of the whole body, and this can only be done by the free application of water. The daily use of a cold bath is not only conducive to health, but a powerful preventive against disease. It is always desirable when we leave a bath that a glow—called the reaction—should be felt all over the body, and this can be assisted by the vigorous use of a rough towel. Bathing in this way is a powerful natural tonic to the skin, nerves, and muscular system. It promotes digestion, regulates the bowels, and is in fact invaluable as a sanitary measure. All underclothing should be changed at least once a week; and socks and stockings every two days. All household furnishings should be kept thoroughly free from dirt. One or two other points should also be noticed. Exercise is one of these. It may be walking or horse exercise. Both are invigorating; both promote appetite and digestion and the healthy action of the functions generally. An outdoor occupation is to be preferred on the score of health. In addition, freedom from anxiety, cheerful society honesty, and the practice of all the virtues are most conducive to the promotion and preservation of health. See also Germ Theory of Disease, Disinfectant, Public Health Acts, etc.

SAN JOAQUIN (hō-ā-kēn), a river of California which traverses the valley of the same name from the Tulare Lakes, joins the Sacramento, and falls into Suisun bay. It has a length of 350 miles.

SAN JOSE (hō-sā'), the capital of Santa Clara co., California, in the valley of Santa Clara, 46 miles by rail s. of San Francisco. The city is embowered in trees and shrubberies, and has a fine park, 6 miles distant, to which leads a beautiful avenue of trees. It contains a courthouse, a theater, state normal school, public halls, a public library, and other good public buildings. Wheat, wine, dried and canned fruits, tobacco, etc., are produced here. Pop. 25,615.

SAN JOSE, capital of the state of Costa Rica, Central America. It stands on a table-land 4500 feet above the sea level. The streets are narrow, and there are few public buildings worthy of note. It is the center of the trade of the state. The climate is healthy, and the town is surrounded with coffee plantations. Pop. 25,000.

SAN JUAN BOUNDARY QUESTION. By the treaty of Washington (15th June, 1846) it was provided that the boundary line between British North America and the United States should be continued to the middle of the chan-

nel between Vancouver's island and the continent, and thence south to the Pacific ocean. But the island of San Juan lies in the middle of this channel, and the question immediately arose to whom the island should belong. It was a subject of long and bitter dispute, but at last the matter was submitted to the arbitration of the Emperor William of Germany without appeal. The emperor's award, dated October 21, 1872, was given unreservedly in favor of the American claim on the ground that the American view of the treaty of 1846 was the more correct one.

SAN LUIS, a province of the Argentine republic. Area, 23,359 sq. miles. The climate is healthy, and rain seldom falls. The province is rich in copper and other metals. The leading industry is cattle-rearing. Pop. 100,000.—The chief town is San Luis de la Punta. It consists chiefly of mud huts surrounded by mimosa thickets. A trade is done in cattle and hides. Pop. 7000.

SAN LUIS DE POTOSI (pot-o-sē'), a city of Mexico, capital of the state of same name, 198 miles n.w. of Mexico, 6350 feet above sea-level; regularly built, with fine streets. It has a handsome cathedral; manufactures of clothing, shoes, hats, etc.; railway workshops; and a considerable trade. Pop. 62,573.—The state has an area of 27,500 sq. miles, is generally fertile, and has rich gold and silver mines. Pop. 516,486.

SAN SALVADOR, a town in Central America, capital of the state of Salvador, situated near the volcano of same name. The inhabitants are chiefly engaged in agriculture. The town was completely destroyed by earthquake on April 16, 1854, and has suffered severely since. It was founded originally in 1528. Pop. 50,000.

SANSKRIT LANGUAGE AND LITERATURE. Sanskrit is the name given to the learned and classical language of the Hindus, the language in which most of their vast literature is written, but which has not been a living and spoken language since about the 2d century before Christ. It is one of the Aryan or Indo-European family of tongues, and may be described as a sister of the Persian, Greek, and Latin, Teutonic, Slavonic, and Celtic tongues. It stands in the same relation to the modern Aryan languages of India as Latin stands to the Romance languages. It is a highly inflected language, having in this respect many resemblances to Greek. To philologists it has proved perhaps the most valuable of tongues and it was only after it became known to Europeans that philology began to assume the character of a science. Its supreme value is due to the transparency of its structure, and its freedom from the corrupting and disguising effect of phonetic change, and from obliteration of the original meaning of its vocables.

Sanskrit literature covers a period extending from at least 1500 B.C. to the present time. The great mass of the literature is in metre, even works on science and law having a poetical form. The oldest literary monuments are the Vedas—the Rig, the Yajur, the Sama, and the Atharva Veda. They are looked upon as the source of all the shāstras

or sacred writings of the Hindus, which, however, include works upon ethics, science, and philosophy as well as religious works. In the department of epic poetry the chief productions are the epics called the Rāmāyana and the Mahābhārata. The Rāmāyana is believed to be the older of the two, and to have been current in India as early as the 5th century B.C. The Mahābhārata is a huge epic of about 220,000 lines, forming rather a cyclopædia of Hindu mythology, legendary history, and philosophy than a poem with a single subject. It is the production of various periods and various authors. In the province of lyric poetry we meet with poems of the greatest eloquence, tender sentiment and beautiful descriptions of nature. We must mention in particular the Meghadūta (Cloud Messenger) of Kālidāsa; the Ritusanhāra (Circle of the Seasons) of the same poet; and the Gitagovinda of Jayadeva, describing the adventures of Krishna. Though the Hindus can boast of some excellent specimens of dramatic poetry, yet, on the whole, their dramas are much inferior to those of the Greeks or of modern Europe. The scientific literature of India is likewise large. Grammar seems to have had a special fascination for the Hindus. The oldest extant grammar is that of Pānini, which belongs to the 2d or 3d century before Christ. In mathematics and astronomy the Hindus have greatly distinguished themselves, as also in medicine and philosophy. Sanskrit literature was first introduced to the western world by Sir William Jones at the end of the 18th century.

SANTA ANNA, Antonio Lopez de, Mexican president, born 1796, died 1876. He took a prominent part in the ex-



Santa Anna.

pulsion of the Spaniards from Mexico, and proclaimed the Mexican republic in 1822. He was in the front during all the Mexican troubles till 1833 when he became president. In 1836 he was defeated and taken prisoner by the Texans, but returned the following year. He was again president in 1846, but on the taking of Mexico by the United States troops in 1847 he resigned. He again held the office in 1853–55; was banished in 1867, but permitted to return in 1874.

SANTA CATHARINA, a maritime state of Brazil, in the south; area, 27,436 sq. miles. It is watered by numerous streams, the soil is fertile, the climate mild, and the seasons regular. Sugar, coffee, rice, corn, mandioca, and wheat are the chief cultivated products. Agriculture and cattle-rearing are the chief

industries. There are a number of German settlements, the inhabitants of that nationality being reckoned at 70,000. The capital is Desterro. Pop. 283,769.

SANTA CLARA (klä'rá), a province of Cuba, occupying the central portion of the island, and bounded by the sea on the north and south, the province of Matanzas on the west, and Puerto Principe on the east. Area, 9560 sq. miles. The province contains some of the largest sugar plantations and factories, while tobacco is also largely raised, and the upland savannas offer rich pasturage. It is also rich in minerals, and asphalt, silver, and copper are mined. Population 156,536. The capital is Santa Clara.

SANTA CRUZ, capital and chief port of the Canary islands on the n.e. coast of Tenerife. The streets are well paved, but the houses are small, and the public buildings few. There is an excellent harbor protected by a mole, and the coast is defended by a number of forts. Wine, brandy, and cochineal are the chief products. Pop. 15,000.

SANTAL' PARGANAS, The, a district in the Bhagalpur division of Bengal area, 5456 sq. miles. The Ganges, which bounds the district on the north and partly on the east, forms also its chief drainage. Various minerals, as coal, iron, and silver, have been found in this district. Pop. 1,754,196.

SANTALWOOD, a dyewood obtained from a leguminous tree of the East Indies, Madagascar, etc.; also called sanders or saunders wood and red sandalwood. Santaline, a substance obtained from it, is used in dyeing blue and brown.

SANTANDER', a city and seaport of N. Spain, capital of the province of same name, on the Bay of Biscay, with a good and secure harbor. Pop. 54,694.—The province is bounded by Biscay, Burgos, Palencia, and Oviedo, and has an area of 2111 sq. miles. The soil is fertile, and produces large quantities of corn, hemp, flax, oranges, lemons, figs, etc. There are also lead, coal, and iron mines, quarries of limestone and marble. The rearing of cattle is common, and the fisheries along the coast are well developed. Pop. 263,673.

SANTERRE (sán-târ), Antoine Joseph, born in Paris 1752, died 1809. As a wealthy brewer he was notable during the French revolution for his influence over the Parisian mob in the attacks on the Bastille and the Tuileries. He rose to be commander of the national guard and a major-general.

SANTIA'GO, the capital of the republic of Chile and of the province of the same name, is beautifully situated at the foot of the Andes, 112 miles by rail e. of Valparaiso. It is intersected by the Mapocho, a rapid stream issuing from the Andes, has water channels in many of the streets, is lighted by electricity, and furnished with tramways. Owing to the prevalence of earthquakes the houses are mostly of one story, and generally occupy a large space of ground, having gardens and patios or courts in the interior. The Plaza or Great Square is a large open area adorned with a fine fountain; around it are the municipal buildings and criminal courts, the post-office, the old palace, formerly the resi-

dence of the presidents, now used as barracks, the cathedral, etc. There are also a mint, a well-appointed university with about 1000 students, high class secondary schools, school of art, military school, normal schools, theater, museum, etc. The city was founded in 1541. The most memorable event in its history was the burning of a church, in which about 2000 persons perished in 1863. Pop. 291,725.

SANTIAGO DE CUBA, a seaport town on the southeast coast of the Island of Cuba. It is the oldest town of the island (having been founded in 1514), is the see of an archbishop, has a fine cathedral several other churches, and a harbor, which, though difficult of access, is spacious and deep. Its trade is considerable. Pop. 43,090.

SANTIAGO DEL ESTE'RO, a town of the Argentine republic, in the province of same name, in a fertile district on the Rio Dulce. Pop. 10,000.—The province has an area of 31,500 sq. miles, and is well suited for cattle-rearing and agriculture. Pop. 160,000.

SANTOS, a city and seaport of Brazil, in the state and 50 miles s.s.e. of Sao Paulo, on the South Atlantic, in an unhealthy locality. The harbor is the best in the state, and the chief outlet for its products, which are coffee, sugar, tobacco, hides, etc. Pop. 50,000.

SAONE, Haute (ôt sôn, Upper Saone), a department in the east of France; area, 2028 sq. miles. Verone is the capital. Pop. 290,954.

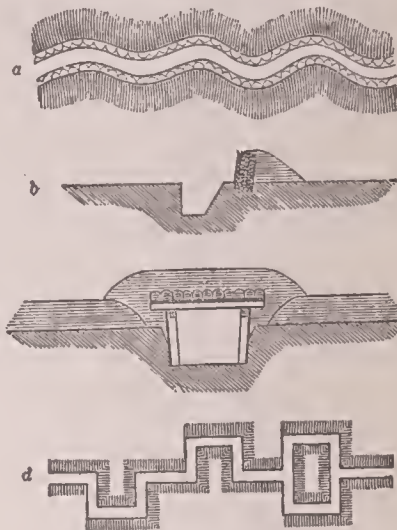
SAONE-ET-LOIRE (sôn-ê-lwâr), a department of E. France; area, 3270 sq. miles. Mâcon is the capital. Pop. 625,885.

SÃO PAULO (sá-yn-pá'y-lô), a maritime state of Brazil, between the two states of Minas-Geraes and Paraná; area, 112,940 sq. miles. Pop. 1,386,242, including 300,000 Italian colonists and 20,000 Germans.—Sao Paulo, the capital is the center of the provincial railways, 86 miles from its seaport Santos, and 143 miles from Rio de Janeiro. The principal edifices are the cathedral, several monasteries and convents, the governor's and the bishop's palace, the townhouse, etc. Pop. 65,000.

SAP, in military affairs, a narrow ditch or trench by which approach is made to a fortress or besieged place when within range of fire. It runs in a zigzag, serpentine, or similar direction, so as not to be enfiladed by the fire of the fortress. The trench is formed by trained men (sappers), who place gabions as a cover, filled with the earth taken from trench along the intended line of parapet; the earth excavated, after the gabions have been filled, being thrown up to form a parapet capable of resisting artillery. The single sap has only a single parapet; the double has one on each side. Sometimes the sap is entirely covered in. The digging of a sap is generally a dangerous operation. In the accompanying figure a is a double sap on the serpentine plan; b, section of single sap, showing portion of gabions; c, section of covered sap; d, sap on rectangular plan.

SAP, the juice or fluid which circulates in all plants, being as indispensable to vegetable life as the blood to animal

life. It is the first product of the digestion of plant food, and contains the elements of vegetable growth in a dissolved condition. The absorption of nutriment from the soil is effected by the minute root-hairs and papillæ, the absorbed nutriment being mainly composed of carbonic acid and nitrogenous compounds dissolved in water. This



Sap, as variously constructed.

ascending, or as it is termed crude sap, is apparently transmitted through the long cells in the vascular tissue of the stem and branches to the leaves, passing from cell to cell by the process known as endosmose.

SAPAJOU (sap'a-jô), the name generally given to a group of South American prehensile-tailed monkeys, including fifteen or sixteen species, whose characteristics it is exceedingly difficult properly to define. Among the species may be named the horned sapajou (also



Capucin sapajou.

called horned capucin); and the capucin. One of the most common species is the weeper. They are small in size, playful in disposition, leading a gregarious life, and feeding chiefly on fruits and insects.

SAPPHIRE (saf'ir), a precious stone, next in hardness and value to the diamond, belonging to the corundum class. Sapphires are found in various places, as Burmah, India, and Ceylon, in Asia; and Bohemia and Silesia, in Europe. The sapphire proper is a beautiful transparent stone of various shades of blue color.

SAPPHO (saf'ō), a distinguished Greek poetess, born at Mitylene, on the island of Lesbos, and flourished about 600 B.C. Little is known regarding her life, though she is made the subject of various legends. Of these may be mentioned the common story of her love for Phaon, which, being unrequited, caused her to leap down from the Leucadian rock. At Mitylene Sappho appears to have been the center of a female coterie, most of the members of which were her pupils in poetry, fashion, and gallantry. Her odes, elegies, epigrams, of which only fragments have come down to us, display deep feeling and imagination. Her reputation among the ancients almost borders on extravagance.

SAPSUCKER, the popular American name of several small woodpeckers.

SARACEN, an Arabian or other Muslim of the early and proselytizing



Sapsucker.

period; a propagator of Mohammedanism in countries lying to the west of Arabia. By mediæval writers the term was variously employed to designate the Arabs generally, the Mohammedans of Syria and Palestine, or the Arab-Berber races of Northern Africa. At a later time it was also applied to any infidel nation against which crusades were preached, such as the Turks.

SARACENIC ARCHITECTURE, the style adopted by the followers of Mahomet in building their mosques, palaces, and tombs. Originally the Arabs possessed no distinctive architectural style, and the style which they at length made their own was developed by architects belonging to the countries which they had conquered. This style is chiefly represented in Egypt, Persia, Spain, Turkey, and India, but the Saracenic architecture of Spain is generally called by the distinctive name of Moorish. The most prominent features of the style are the dome, the minaret, and the pointed arch. The Saracenic domes rise from a square base, are graceful in form, sometimes in groups of three or more, and frequently enriched externally with colored tiles or other decorations. The minarets are slender towers of considerable height, rising in stages or stories, each with a balcony, and are most frequently octagonal, sometimes cylindrical, rising, however, from a square base. The arch is of the pointed variety, this form of arch having been used by the Arabs in Egypt before the rise of the

Gothic in Europe. It is sometimes of the horse-shoe form. The use of clustered pendentives (honey-comb work) to form a transition from the quadrangular area under a dome to the arch of the dome itself is very peculiar and common. Ex-

Saracenic architecture.
Mosque of Kald Bey, Cairo.

ternally the tops of walls are often finished off with an upright cresting, which may be regarded as an ornament taking the place of a cornice. Flat surfaces are freely ornamented with a profusion of scroll-work and conventional foliage, often in intricate and beautiful design. Stucco is much used in ornamentation.

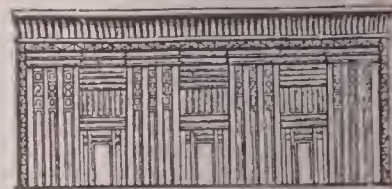
SARAGOSSA, or **ZARAGOZA**, a city of Spain, in Aragon, capital of the province of the same name, as well as of the ancient kingdom of Aragon, about 20 miles n.e. of Madrid by rail in a fertile plain irrigated by the Ebro. Pop. 98,188.

SARATOGA SPRINGS, a town in the state of New York, about 35 miles north of Albany, and 186 miles north of New York City by rail. It owes its prosperity to its mineral-springs, which have made it the most fashionable watering-place in the United States. The springs are characterized by their saline and chalybeate ingredients, combined with carbonic acid gas. It has numerous large and handsome hotels, several churches, etc., and during the season has an influx of about 35,000 visitors. Ordinary population about 14,000.

SARATOV, a city of Russia, capital of the government of same name, is built on broken and undulating ground on the right bank of the Volga, 459 miles southeast of Moscow, and surrounded by gardens. Pop. 137,109.—The government has an area of 32,613 sq. miles. The principal exports are corn, hemp, flax, tobacco, hops, and madder. Pop. 2,419,884.

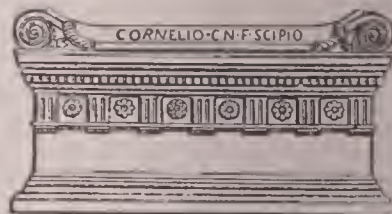
SARA'WAK, a rajahship in the island of Borneo, under British protection. It is situated on the west and northwest side of the island, and has a coast-line of about 400 miles, while it extends inland for more than 100 miles; area about 50,000 sq. miles. The more important vegetable productions are cocoa-nuts, rice, and sago. The minerals include gold, antimony, and quicksilver, and diamonds are also found. The original inhabitants are Dyaks, but are now very much intermixed with Malays and Chinese. The rajahship was conferred upon Sir James Brooke by the Sultan of Borneo in 1841 in return for distinguished services in quelling disturbances and restoring order, and when he died in 1868 he was succeeded by his nephew. Capital, Kuching. Pop. 300,000.

SARCOPH'AGUS, a coffin or tomb of stone; a kind of stone chest, generally more or less ornamented, for receiving



Egyptian sarcophagus—Third pyramid.

a dead body. The oldest known sarcophagi are Egyptian, and have been found in certain of the pyramids. Two of the most celebrated of these are the great sarcophagus taken by the British in Egypt in 1801, now in the British museum, and the alabaster sarcophagus in the Sloane museum, London. Sarcophagi were also used by the Phœni-



Roman sarcophagus—Tomb of Scipios.

cians, Persians, and Romans; and in modern times stone coffins have not been uncommon for royalty and persons of high rank.

SARD, a variety of chalcedony, which displays on its surface a rich reddish brown, but when held between the eye and the light appears of a deep blood-red carnelian.

SARDANAPA'LUS, the name in Greek of several kings of Assyria, one of whom is said to have been the last king of Assyria. He is represented by Ctesias as a very effeminate prince, wholly given to sensual indulgence and inactivity, and it is related that Arbaces, a Median satrap, in conjunction with Belesis, a Babylonian priest, raised an army of Medes against him about 785 B.C. This army, attacking his camp by night, gained a great victory, and pursued the fugitives to the gates of Nineveh. Here Sardanapalus defended himself for two years, but ultimately set his palace on

SARDINE

fire and perished in the conflagration with all his wives and attendants.

SARDINE, a small fish, now generally regarded as identical with the pilchard, abundant in the Mediterranean and also on the Atlantic coasts of France, Spain, and Portugal. It is much esteemed for its flavor, and large quantities are preserved by being salted and partly dried,



Californian sardine.

then scalded in hot olive-oil, and finally hermetically sealed in tin boxes with hot salted oil, or oil and butter.

SARDINIA, an island in the western half of the Mediterranean, forming part of the Italian kingdom and separated from the island of Corsica by the strait of Bonifacio, not quite 7 miles wide; length, 152 miles; central breadth, about 66 miles; area, 9350 sq. miles. The coast is in great part rugged and precipitous, and though the island is nearly in the form of a parallelogram there are some important indentations, such as the Gulf of Asinara in the northwest, the Bay of Oristano in the west, and the Gulf of Cagliari, in the southeast, on which Cagliari, the capital of the island, is situated. The interior is generally mountainous; the chain which traverses Sardinia sends out branches east and west, and culminates in Brunca, 6291 feet, and Gennargentu, 6132 feet. The rearing of live stock forms an important industry. Game of all kinds is very abundant. Wild boars, stags, deer, and muffsions frequent the woods and forests. The most valuable fishery is that of the tunny. For administrative purposes Sardinia is divided into the two provinces of Cagliari and Sassari. The inhabitants are of Italian race, with a mixture of Spanish, and are characterized by a chivalric sense of honor and hospitality, but the family feud or vendetta still exists. See next article. Pop. 789,314.

SARDINIA, KINGDOM OF, a former kingdom, of the south of Europe, composed of the Island of Sardinia, the Duchy of Savoy, the Principality of Piedmont, the county of Nice, the Duchy of Genoa, and parts of the Duchies of Montferrat and Milan; 28,229 sq. miles; pop. (1858), 5,194,807. In 1720 Victor Amadeus II., duke of Savoy, on receiving the island of Sardinia in exchange for Sicily, took the title of King of Sardinia. He was succeeded by Charles Emmanuel III., Victor Amadeus III., and Charles Emmanuel IV., who in 1802 abdicated in favor of his brother Victor Emmanuel I., the royal family having by this time, during the domination of Napoleon, taken refuge on the island of Sardinia. In 1814 the king returned to Turin, where the seat of government was established. An insurrection occasioned his abdication in 1821 in favor of Charles Felix, who, after a reign of ten years, was succeeded by Charles Albert. In 1848 he headed the league which endeavored to drive the

Austrians from Italy. The defeat of the Sardinian forces at Novara (1849) by Radetsky, however, caused him to abdicate in favor of his son Victor Emmanuel II. The position of Sardinia was strengthened by the part which it played (1854) in the Crimean war, while in 1859 the co-operation of France was secured in a war against Austria. The brief campaign which followed ended in the defeat of the Austrians at Magenta and Solferino, and led to Sardinia receiving a large increase of territory, though she had to cede Savoy and Nice to France. Soon after this the Sardinian Kingdom was merged in a united Italian Kingdom under Victor Emmanuel. See Italy.

SARD'ONYX, a precious stone, a beautiful and rare variety of onyx, consisting of alternate layers of sard and white chalcedony. The name has sometimes been applied to a reddish-yellow or nearly orange variety of chalcedonic quartz resembling carnelian, and also to carnelians whose colors are in alternate bands of red and white.

SARDOU, Victorien, French dramatist, born at Paris in 1831. He was successful with two plays which he wrote for Déjazet called *M. Garat* (1860) and *Les Prés-Saint-Gervais* (1862). His better-known works, many of which have been produced on the English stage, are *Les Pattes de Mocuhe*, *Nos Intimes*, *La Patrie*, *Daniel Rochat*, *Thermidor*, and *Madame Sans-gêne*. Some of his successes have been associated with Madam Bernhardt. He wrote *Fedora*, *Theodora*, and *La Tosca*. He died in 1908.

SARGENT, Epes, an American poet, and dramatist, was born at Gloucester, Mass., in 1813; died at Boston in 1880. He was the author of that well-known lyric, *A Life on the Ocean Wave*.

SARGENT, John Singer, American portrait and figure painter, was born in Florence, Italy, in 1856. His first exhibited pictures were "En route pour la pêche," a group of fisher girls upon the beach, and "Neapolitan Children Bathing." He has received the highest medals and honors, including the Grand Prix at the Paris expositions of 1889 and 1900, and in 1889 he was made chevalier, and in 1895 officer of the Legion of Honor. Among the best known of his portraits are those of Carolus Duran and Dr. Pozzi, Edwin Booth, Lawrence Barrett, and Joseph Jefferson. He exhibited nine works at the Columbian exposition (1893), among which were *Ellen Terry as Lady Macbeth*. In 1903 he visited the United States and made portraits of President Roosevelt, Secretary Hay and others.

SARSAPARIL'LA, the rhizome of several plants of the genus *Smilax*. *Sarsaparilla* is valued in medicine on account of its mucilaginous and demulcent qualities.

SARTHE (sârt), a department of Northwest France; area, 2395 sq. miles. It has a diversified surface, presenting fertile plains, vineyards, and extensive forests. The capital is Le Mans. Pop. 436,111.

SA'SIN, the common Indian antelope, remarkable for its swiftness and beauty. It is abundant in the open dry plains of India, in flocks of from ten to sixty females to a single male. It is grayish

SASSAFRAS

brown or black on the upper parts of the body, with white abdomen and breast, and a white circle round the



Sasin or Indian antelope.

eyes, and stands about 2 feet 6 inches high at the shoulder.

SASKATCH'EWAN, a great river of Canada, which rises in the Rocky mountains near lon. 115° w. by two principal heads, the sources of which are not far apart. These branches, often called the North and South Saskatchewan, flow generally east to their junction about 150 miles northwest of the northwest angle of Manitoba, whence the river takes a curve northeast and southeast, and, passing through Cedar lake, empties itself into Lake Winnipeg, after a course of about 1300 miles, measuring along the south branch, some 70 less measuring along the north. The main stream and its branches afford about 1000 miles of navigable waterway.

SASKATCHEWAN, a province of Canada, named from the above river, bounded on the s. by Assiniboia, e. by Lake Winnipeg and Nelson river, n. by the 55th parallel, and w. by Alberta. Area, 250,650 sq. miles; pop. 94,000. Capital, Regina; Prince Albert and Battleford are the other chief towns, both being on the Saskatchewan.

SAS'SABY, an antelope found in South Africa, living gregariously in herds numbering from six to ten individuals.



Sassaby.

The body-color is a reddish-brown, the limbs being of dark hue, while a blackish stripe marks the forehead and middle of the face.

SAS'SAFRAS, a genus of plants. It is a small tree or bush inhabiting the woods of North America from Canada to Florida. The taste of sassafras is sharp, acrid, aromatic; it is used for flavoring purposes, and in medicine as a stimulant.

Swamp-sassafras is the *Magnolia glauca*, an American tree.

SAS'SARI, a town of Italy, in Sardinia, capital of the province of same name 105 miles n.n.w. of Cagliari. Pop. of town, 38,178; a province occupying the north and more fertile part of the island. Pop. 307,314.

SATA'RA, a district, in the Bombay presidency, India; area, 4987 sq. miles, forming part of the table-land of the Deccan, much broken by ridges, ravines, and isolated heights. The chief river is the Kistna, which flows southeast through its center. Pop. 1,146,521.—The capital of the district is also called Satára, and is situated 55 miles south of Poona, near the confluence of the Krishna and the Yena. Pop. 26,022.

SAT'ELLITE, a secondary planet, or moon; a small planet revolving round a larger one. The earth has one satellite, called the moon; Neptune is also accompanied by one; Mars by two; Uranus by six; Jupiter by four; Saturn by eight. Saturn's rings are supposed to be composed of a great multitude of minute satellites.

SATIN, a soft, closely-woven silk, with a glossy surface. In the manufacture of satin part of the weft is left beneath the warp, which, presenting a close and smooth surface, acquires, after being passed over heated cylinders, that luster which distinguishes it from other kinds of silks.

SATINET, a twilled cloth made of woolen weft and cotton warp pressed and dressed to produce a glossy surface in imitation of satin.

SATINWOOD, the wood of a large tree. It is a native of the mountainous parts of the Circars in the East Indies. The wood is of a deep yellow color, close-grained, heavy and durable.

SATIRE, in the widest sense of the word, pungent ridicule or cutting censure of faults, vices, or weaknesses. In a narrower sense it is a poem of which ridicule and censure are the object and chief characteristic. This species of poetry had its origin with the Romans, but satires may also take the forms of epistles, tales, dialogues, dramas (as with Aristophanes), songs, epics, fables, etc. The didactic satire originated with Lucilius (148-103 B.C.), and Horace, Juvenal, and Persius developed it. Satirists are common in all modern literatures.

SATOLLI (sà-to'l'le), Francesco, Italian cardinal, was born at Perugia in 1831. In 1888 Satolli was made titular archbishop of Lepanto. In 1892 Mgr. Satolli was sent to the United States as papal ablegate with plenary power, which was confirmed by his appointment in 1893 as apostolic delegate to the American church, with an official residence in Washington. He was elevated to the cardinalate in 1895, and was re-called and succeeded by Archbishop Sebastiano Martinelli in 1896.

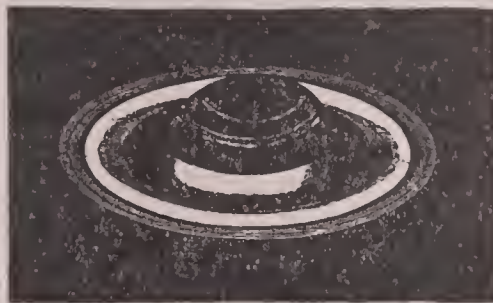
SATRAPS, in the ancient Persian empire, the governors of the provinces which were called satrapies. The power of the satrap, so long as he retained the favor of his sovereign, was absolute; he levied taxes at his pleasure and aped the capricious tyranny of his master unchecked.

SATURATION. In meteorology the air is said to be saturated with aqueous vapor, if, when the temperature is slightly lowered, condensation takes place. The degree of saturation at any place is called the hydrometric state. The term is applied in chemistry to the union, combination, or impregnation of one body with another in such definite proportions as that they neutralize each other, or till the receiving body can contain no more.

SATURDAY (A. Sax. Sæterdæg, Sæterndæg—Sater, Sætern, for Saturn, and dæg, a day—the day presided over by the planet Saturn), the seventh or last day of the week; the day of the Jewish Sabbath.

SATURN, an ancient Italian deity, popularly believed to have made his first appearance in Italy in the reign of Janus, instructing the people in agriculture, gardening, etc., thus elevating them from barbarism to social order and civilization. He was consequently elected to share the government with Janus, and his reign came afterward to be sung by the poets as "the golden age." He was often identified with the Cronus of the Greeks. His temple was the state treasury. Ops was his wife. He is often represented as an elderly man, with a sickle and ears of corn in his hand. See Saturnalia.

SATURN, one of the planets of the solar system, less in magnitude than Jupiter, and more remote from the sun. Its mean diameter is about 70,000 miles, its mean distance from the sun somewhat more than 872,000,000 miles, and



The planet Saturn.

its year or periodical revolution round the sun nearly twenty-nine years and a half. Its mass is about 90 times that of the earth. Saturn is attended by eight satellites, and surrounded by a system of flat rings, which are now supposed to be an immense multitude of small satellites, mixed probably with vaporous matter. See Planet.

SATURNA'LIA, a festival held by the Romans in honor of Saturn, and during which the citizens with their slaves gave themselves up to unrestrained freedom and mirth. It contained at first one day; then three; afterward five; and finally under the Cæsars, seven days, namely, from the 17th to the 23d of December. During its continuance no public business could be transacted, the law courts were closed, the schools kept holiday, and slaves were freed from restraint. Masters and slaves even changed places, so that while the servants sat at table, they were waited on by their masters and their guests. In the last days of the

festival presents were sent by one friend to another.

SATYRS, in Greek mythology, a class of woodland divinities, in later times, inseparably connected with the worship of Dionysus (Bacchus). The satyrs appear in works of art as half-man and half-goat, having horns on the head, and a hairy body with the feet and tail of a



Satyr—The Barberini Faun, at Munich.

goat. They are described as being fond of wine and of every kind of sensual gratification. One of the most famous specimens of Greek art is the Satyr (or Faun) of Praxiteles.

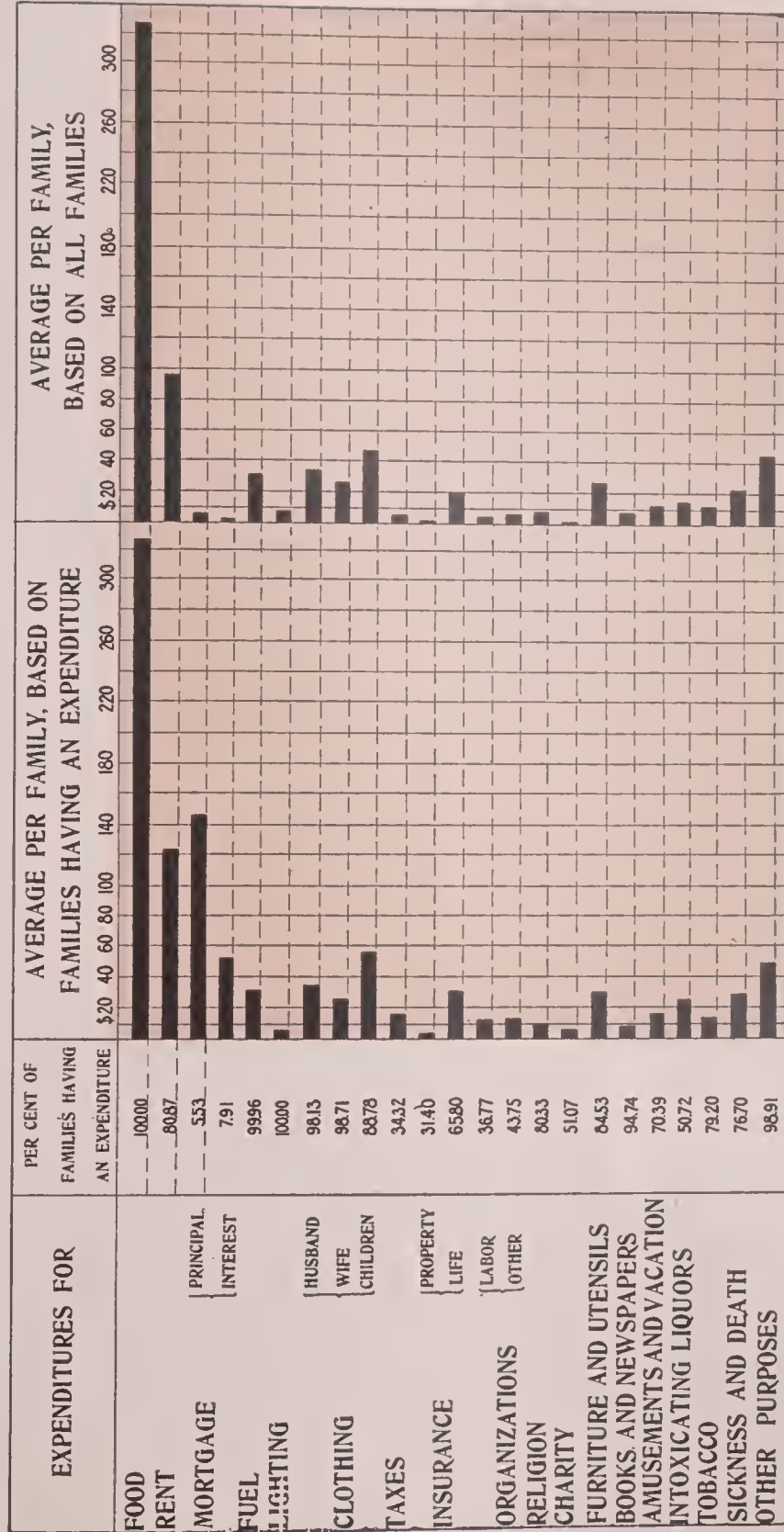
SAUERKRAUT (zou'ér-kROUT), a favorite German dish, consisting of cabbage cut fine, pressed into a cask, with alternate layers of salt, and suffered to ferment till it becomes sour.

SAUL, king of Israel, from about 1095 to 1056 B.C., and the son of Kish, a Benjamite. Selected for this office by Samuel, he obtained, by his personal courage and military capacity, several successes over the Philistines, Edomites, Moabites, and Ammonites by means of which he consolidated the tribes and confirmed his authority. After a long reign the wild nature of the king at length showed itself in a kind of religious frenzy. This frenzy, which is briefly described in the Bible as an "evil spirit of God," led him to the massacre of the priests of Nob and various similar excesses. Meanwhile the prophet Samuel, estranged by the king's misdeeds, had anointed David as his successor, and this took effect when Saul was slain by his own sword in a battle with the Philistines on Mount Gilboa.

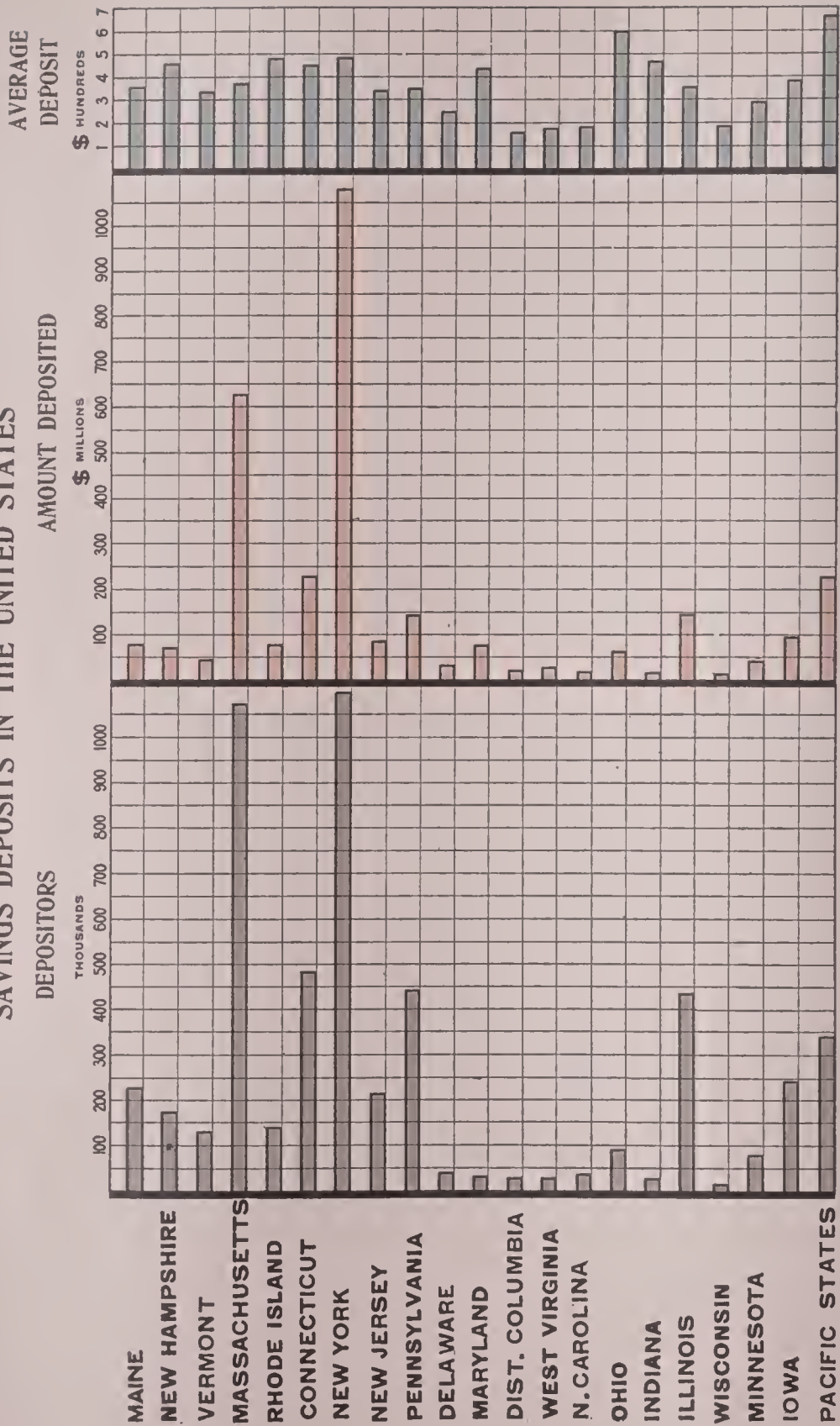
SAULT SAINTE MARIE (são sânt ma'rê), the county seat of Chippewa co., Mich., 350 miles west northwest of Detroit; on the Saint Mary's river, and on the Canadian Pacific, the Duluth, South Shore and Atlantic, and the Minneapolis, Saint Paul and Sault Ste. Marie railroads. The ship canal here, connecting Lakes Superior and Huron, is noted for its extensive freight traffic. The water power afforded by the rapids near the city generates electrical energy equivalent to 100,000 horse power. There are lumber mills, paper mills, a carbide manufactory, dredging machinery works

AVERAGE EXPENDITURE PER FAMILY FOR VARIOUS PURPOSES

FROM REPORTS OF 2,567 AMERICAN FAMILIES



SAVINGS DEPOSITS IN THE UNITED STATES



SAURIA

SAW-FLIES

flour and woolen mills, and fish-packing establishments. Pop. 12,172.

SAU'RIA, the term by which the great order of lizards is sometimes designated, including not only the existing lizards, crocodiles, monitors, iguanas, chameleons, etc., but also those fossil reptiles the ichthyosaurus, plesiosaurus, iguanodon, pterodactyl, etc.

SAUROID FISHES, fishes, chiefly fossil, that combine in their structure certain characters of reptiles. The existing sauroid fishes consist of several species, the best known being the bony pikes and sturgeons.

SAUTERNE, a white Bordeaux wine of high repute, produced from grapes grown in the neighborhood of Sauternes, a village in the department of Gironde, s.e. of Bordeaux.

SAVAN'NA, Savannah, an extensive open plain or meadow in a tropical region, yielding pasturage in the wet season, and often having a growth of undershrubs. The word is chiefly used in tropical America.

SAVAN'NAH, a river of the United States, which forms the northeast boundary of Georgia, and separates it from South Carolina. It is formed by the junction of the Tugaloo and Keowee, 100 miles by the course of the river above Augusta, and is navigable for vessels drawing over 18 feet to the city of Savannah, 18 miles from the sea.

SAVANNAH, the capital of Chatham co., Georgia, on the south bank of Savannah river, 18 miles from the sea (by river). It is built on a flat sandy bluff 40 feet high, and is beautifully laid out with wide streets and many squares, most of which are adorned by magnolias, live-oaks, and other stately trees. It has a well-wooded park, several good monuments, handsome cotton exchange, court-house, and other public buildings. It is the second cotton port in the United States, and exports also quantities of timber, turpentine, rosin, etc., besides fruits and early vegetables coastwise. From evaporation of the surrounding waters the atmosphere during summer is very humid. Pop. 1909, 80,000.

SAV'ARY, Anne Jean Marie René, Duke of Rovigo, French general, born 1774; died 1833. When the emperor returned from Elba he was joined by Savary, who, after the defeat at Waterloo, desired to share his imprisonment in St. Helena. He was afterward employed by the government of Louis Philippe as commander-in-chief in Algeria.

SAVINGS BANKS, the first savings bank established in Europe is said to have been at Brumath, France, in 1765. The first German savings bank was established at Hamburg in 1778. The first English bank was established in 1799. Post office savings banks were established in England in 1861. In the United States the Philadelphia Saving Fund Society was founded in 1816, and received a charter in 1819; and between 1817 and 1846 twelve states had granted such charters to savings banks within their bounds, especially the New England states; fifty years later there were 684 banks in the United States. School savings banks have been largely introduced in the United States. Its usefulness, however, is still problematical.

Most of the states have endeavored, ineffectually, to prevent the savings banks from becoming rivals to other banks, so as to reserve their privileges for the poorer classes. The following table shows the progress of savings banks in the United States:

SAVINGS BANKS, DEPOSITORS, AND DEPOSITS IN THE UNITED STATES EVERY TEN YEARS FROM 1830 TO 1890 AND ANNUALLY SINCE 1895.

Year	Number of Banks	Number of Depositors	Deposits
1830.....	36	38,085	\$ 6,973,804
1840.....	61	78,701	14,051,520
1850.....	108	251,354	43,431,130
1860.....	278	693,870	149,277,504
1870.....	517	1,630,846	549,874,358
1880.....	629	2,335,582	819,106,973
1890.....	921	4,258,893	1,524,844,506
1895.....	1,017	4,875,519	1,810,597,023
1896.....	988	5,065,494	1,907,156,277
1897.....	980	5,201,132	1,939,376,035
1898.....	979	5,385,746	2,065,631,298
1899.....	942	5,687,818	2,230,366,954
1900.....	1,002	6,107,083	2,449,547,885
1901.....	1,007	6,353,723	2,597,094,580
1902.....	1,036	6,666,672	2,750,177,290
1903.....	1,073	7,035,228	2,935,204,845
1904.....	1,157	7,305,443	3,060,178,611
1905.....	1,237	7,696,229	3,261,236,119
1906.....	1,319	8,027,192	3,482,137,198
1907.....	1,415	8,588,811	3,690,078,945

The above table was compiled from the report of the Comptroller of the Currency.

SAVONARO'LA, Girolamo, Italian ecclesiastical reformer, born at Ferrara 1452. Educated for the medical profession, he yet secretly entered the order of Dominicans at Bologna in 1475. In 1482 he was sent to St. Mark's convent at Florence, and began to preach there, but with little success. He retired into Lombardy, and there his increasing fame as a preacher and theologian induced Lorenzo de' Medici to invite him (1490) to return to Florence. And now his discourses attracted such crowds that the church could not contain them the great theme of his eloquence being the corruptions in church and state, and the



Girolamo Savonarola.

general iniquity of the times. In 1491 he was elected prior of St. Mark's. At this time Italy enjoyed profound peace, but Savonarola startled his hearers by foretelling the advent of foreign enemies bringing desolation; and this prediction was considered by the people to have been fulfilled when Charles VIII. of France in 1494 invaded Italy. Further, this Dominican preacher of St. Mark's claimed to be a special messenger from God, to be the recipient of divine revelations, to see visions, and to have the gift of prophecy. He foretold the death

of the pope, the king of Naples, and his patron Lorenzo. When the latter was on his deathbed (1492) Savonarola refused to grant him absolution unless under conditions which the prince refused. After the death of Lorenzo and the expulsion of his son Piero, Savonarola put himself at the head of those who demanded a more democratical form of government; and such was now his commanding influence in Florence that he organized the distracted city into a form of republic, with two councils and a governing signory. But in his zeal, not content with revolutionizing Florence, he meditated the reform of the Roman court and of the irregularities of the clergy. To this end he wrote to the Christian princes, declaring that the church was corrupt, and that it was their duty to convoke a general council. Alarmed at this, Alexander VI., who was then pope, excommunicated him in 1497, and the bull was read in the cathedral at Florence. But besides the papal and political influences which were now arrayed against Savonarola, his innovations in St. Mark's and other monasteries had excited the enmity of the monks, especially the Franciscans. In these circumstances Francesco di Puglia, a Franciscan friar, challenged Savonarola to test the truth of his divine pretensions by passing with him through the ordeal of fire. This Savonarola declined; scenes of tumult and riot arose; St. Mark's was stormed by an infuriated mob and Savonarola cast into prison. As the result of the mock trial with torture which followed in 1498, Savonarola, with two of his companions, was strangled and then burned. His writings consist of some theological works, a treatise on the Government of Florence, and numerous sermons.

SAVOY, Duchy of, formerly a division of the Sardinian kingdom, now forming two of the departments of France; bounded on the north and northeast by Switzerland, on the east and southeast by Piedmont, and on the south and west by the French departments of Isère and Ain. By treaty (1860) Savoy was ceded by Sardinia to France (see Sardinia, Kingdom of), of which it now forms two departments, Savoie, area 1769 sq. miles pop. 267,428, and Haute Savoie, area 1314 sq. miles, pop. 275,018. The capital of the former is Chambéry, of the latter Annecy.

SAWANTWA'RI, a native state in the Bombay presidency, situated about 200 miles south of Bombay, bounded north and west by the British district of Ratnigiri, and on the south by the Portuguese territory of Goa; area, 900 sq. miles. Pop. (mostly Hindu), 217,800.

SAWFISH, a fish nearly related on the one hand to the sharks, and on the other to the rays. It attains a length of from 12 to 18 feet, has a long beak or snout, with spines projecting like teeth on both edges, armed with which it is very destructive to shoals of small fishes, and is said to attack and inflict severe and even mortal injuries on the large cetaceans or whales.

SAWFLIES, a group of insects belonging to the order Hymenoptera, and distinguished by the peculiar conformation of the ovipositor of the females,

SAWS

which is composed of two broad plates with serrated or toothed edges, by means of which they incise the stems



Saw-fly.

a, Turnip saw-fly. b, Ovipositor of saw-fly magnified to show the saw.

and leaves of plants, and deposit their eggs in the slits thus formed. The turnip-fly and the gooseberry fly are examples.

SAWS are instruments with a dentated or toothed edge employed to cut wood, stone, ivory, or other solid substance, and are either straight or circular. In form and size they vary from the minute surgical or dental tool to the large instrument used in sawmills. The cross-cut saw, for cutting logs transversely, is a large straight saw wrought by two persons, one at each end. The ripping saw, half-ripper, hand-saw, and panel saw are saws for the use of one person, the blades tapering in length from the handle. Tenon saws, sash saws, dove-tail saws, etc., are saws made of very thin blades of steel stiffened with stout pieces of brass, iron, or steel fixed on their back edges. They are used for forming the shoulders of tenons, dove-tail joints, etc., and for many other purposes for which a neat clean cut is required. Compass and keyhole saws are long narrow saws, tapering from about 1 inch to $\frac{1}{2}$ inch in width, and used for making curved cuts. Machine saws are comprehended under three different classes—circular, reciprocating, and band saws. The circular saw is a disc of steel with saw teeth upon its periphery. It is made to revolve with great rapidity and force, while the log is pushed forward against it by means of a traveling platform. The reciprocating saw works like a two-handed hand saw, being driven upward and downward and the wood carried forward against its teeth. The band saw or ribbon saw consists of a thin endless saw placed like a belt over two wheels, and strained on them. The ribbon passes down through a flat sawing table, upon which the material to be cut is laid. Saws for cutting stone are without teeth. The sawing of timber is an important industry in some countries, especially the United States and Canada, where immense quantities of lumber are produced. Water power is often employed to drive the machinery of the sawmills, but steam is equally common.

SAXE (saks), Herman Maurice, Comte de, Marshal of France, natural son of Augustus II., king of Poland, by Aurora, countess of Königsmark, born at Dresden 1696, died 1750. In 1747 he was victorious at Laufeldt, and in the following year took Maestricht, soon after which the peace of Aix-la-Chapelle was

concluded. He wrote a treatise entitled *Mes Réveries*, on the art of war.

SAXE, John Godfrey, American litterateur, born 1816, died 1887. His poems include *Progress*, a Satirical Poem (1846); *Humorous and Satirical Poems* (1850); *Money King* (1859); *Flying Dutchman* (1862); *Clever Stories of Many Nations* (1865); *The Masquerade* (1866); *Fables and Legends* (1872); and *Leisure Day Rhymes* (1875).

SAXE-ALTENBURG, an independent duchy in Thuringia, forming one of the states in the German empire, is divided into two nearly equal portions by a part of Reuss, and is bounded on the s.w. by the grand duchy of Saxe-Weimar-Eisenach, on the n. by Prussia, and on the e. by Saxony; area, 510 sq. miles. The capital is Altenburg. Pop. 194,914.

SAXE-COBURG-GOTHA, a duchy of Central Germany, one of the states of the German empire, comprising the province of Gotha, lying between Prussia, Schwarzburg, Meiningen, and Weimar; and the province of Coburg, lying between Meiningen and Bavaria; Coburg 218 sq. miles, and Gotha 542 sq. miles. The government is a constitutional monarchy, and each province has its own elective assembly, while the duchy sends one member to the Bundesrath and two to the Reichstag of the German empire. For affairs common to both divisions the assemblies meet conjointly at Coburg and at Gotha alternately. The ducal house and the greater part of the population are Lutherans. Albert Prince Consort of England, was a brother of Duke Ernest II., who was succeeded in the dukedom by the late Duke of Edinburgh, and he in 1900 by Leopold, son of the late Duke of Albany. Pop., Coburg, 66,814; Gotha, 162,736; total, 229,550.

SAXE-MEININGEN, a duchy of Central Germany, and one of the states of the German empire, consisting of a main body, and several minor isolated portions. Area, 955 sq. miles. The government is a hereditary and constitutional monarchy, and the great majority of the inhabitants are Lutherans. The duchy sends one member to the Bundesrath and two to the Reichstag of the German empire. The capital is Meiningen. Pop. 250,683.

SAXE-WEIMAR, a grand duchy of Central Germany, one of the states of the German empire, and consisting of three larger portions, Weimar, Neustadt, and Eisenach, and twelve smaller parcels. Area of the whole, 1421 sq. miles. The government is constitutional, the legislative power being vested in a house of parliament, consisting of one chamber of thirty-one members. Saxe-Weimar sends one member to the Bundesrath and three to the Reichstag of the German empire. Pop. 362,873.

SAXHORN (after M. Sax, of Paris, the inventor), a name of several brass wind instruments, with a wide mouth-piece and three, four, or five pistons, much employed in military bands. These horns comprise the piccolo cornet or high small saxhorn, the soprano, the alto, the tenor, baritone, bass, and double bass.

SAXIFRAGE, a popular name of various plants, mostly inhabitants of

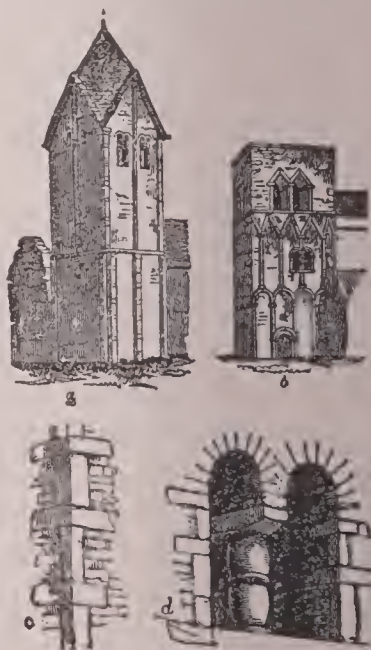
SAXON ARCHITECTURE

alpine and subalpine regions of the colder and temperate parts of the northern zone. Most of them are true rock plants, with tufted foliage and panicles of white, yellow, or red flowers; and many are well known as ornamental plants in gardens.



Bass Saxhorn.

SAXON ARCHITECTURE, the earliest stage of native English architecture, its period being from the conversion of England to Christianity till the Conquest or near it, when Norman architecture began to prevail (7th to 11th century). The few relics left us of this style exhibit its general characteristic as having been rude solidity and strength. The walls are of rough masonry, very thick, without buttresses, and sometimes of herringbone work; the towers and pillars thick in proportion to height,



Saxon architecture.

a, Tower of Sompting church, Sussex. b, Tower of Barton-on-Humber church, Lincolnshire. c, Long and short work. d, Window with a baluster.

the former being sometimes not more than three diameters high; the quoins or angle masonry are of hewn stones set alternately on end and horizontally; the arches of doorways and windows are rounded, or sometimes these openings have triangular heads, their jambs of long and short work carrying either rudely carved imposts or capitals with square abaci. Sometimes heavy mouldings run round the arches, and where two or more arches are conjoined in an

SAXONS

arcade these are on heavy low shafts formed like balusters. Window openings in the walls splay from both the interior and the exterior, the position of the windows being in the middle of the thickness of the wall.

SAXONS, a Teutonic race whose name is generally derived from the Old German word *sahs* (a knife or short sword). They are first mentioned by Ptolemy, who speaks of them as inhabiting a district bounded by the Eider, the Elbe, and the Trave. In the 3d century of the Christian era they were a numerous, warlike, and piratical people. In the 5th century considerable hordes of them crossed from the continent, and laid the foundations of the Saxon kingdoms in Britain—Essex or East Saxons, Sussex or South Saxons, etc. (See England and Anglo-Saxons.) Those who remained in Germany (Old Saxons) occupied a great extent of country, of vague and varying limits, which bore the general name of Saxony. Charlemagne waged a thirty years' war against the Saxons; and Wittikind, their national hero, with many of his countrymen, submitted to his arms, and embraced Christianity. See Saxony, Kingdom of.

SAXON SWITZERLAND, a name which has been given to part of the kingdom of Saxony, on the Elbe, south-east of Dresden and bordering on Bohemia. It consists of a group of mountains of sandstone, with valleys and streams of the most picturesque character, in which isolated masses of sandstone, large and small, occur in very fantastic shapes. It is about 24 miles long, and equally wide.

SAXONY, Kingdom of, a kingdom of Central Germany; bounded on the north-west, north, and east by Prussia, south-east and south by Bohemia, southwest by Bavaria and west by Reuss, Saxe-Weimar, and Saxe-Altenburg; greatest length, 135 miles; greatest breadth, 75 miles; area, 5786 sq. miles (or rather less than Yorkshire); pop. 4,199,758. For administrative purposes it is divided into the five districts of Dresden, Leipzig, Zwickau, Chemnitz, and Bautzen.

With the exception of a very small portion of the east, which sends its waters to the Baltic, Saxony belongs to the basin of the Elbe, which traverses it in a northwesterly direction for about 70 miles. On the Prussian frontiers, where the district subsides to its lowest point, the height above the sea is only 250 feet.

The most important crops are rye, oats, barley, wheat, potatoes; and orchard fruits, particularly apples, pears, and plums, are very abundant. Considerable attention is paid to the culture of the vine. Large numbers of horned cattle are exported. The wool of Saxony has long been celebrated for its excellence. Swine and horses are of a superior breed. The minerals are of great importance, and include silver, lead, tin, iron, cobalt, nickel, bismuth, and arsenic. Numerous seams, both of lignite and coal, are found in various districts, and are worked to a considerable extent. The quarries furnish in abundance granite, porphyry, basalt, marble, serpentine, and sandstone. Several mineral springs of reputation exist. Saxony is

an important manufacturing country. The principal manufactures are cotton and woolen goods, linen, lace, ribbons, and straw-plaiting. Other industries are earthenware, Dresden ware, leather, chemicals, etc., and the printing establishments of Leipzig are well known. Saxony is connected with the great trunk lines which traverse Central Europe, and has over 1500 miles of railway.

The government is a constitutional monarchy (forming part of the German empire), in which the executive power is lodged solely in the crown, and the legislative power jointly in the crown and two chambers. The present ruling family in Saxony claims descent from Wittikind, the national hero who was conquered by Charlemagne and embraced Christianity. The territory became a duchy about 880, and in the 10th century Duke Henry was elected German emperor. In 1813 Saxony was the scene of Napoleon's struggle with the allies, and the battles of Lützen, Bautzen, Dresden, and Leipzig were followed by the congress of Vienna (1814), when a large part of the dominions then under the Saxon monarch was ceded to Prussia. A period of great progress followed, interrupted somewhat at the revolutionary period of 1848-49. In the Austro-Prussian war of 1866 Saxony took part with Austria, and was occupied by the Prussian troops. Prussia desired to incorporate the kingdom, but Austria, supported by France, opposed this arrangement, and Saxony was admitted into the North German confederation instead. In the Franco-German war Saxony united with the rest of Germany against France; and the late King Albert (then crown-prince) was commander of the German army of the Meuse. In 1871 Saxony became a member of the New German Empire.

SAXONY, Prussian, a province of the Prussian monarchy, of irregular shape, and with isolated districts, almost in the center of Germany, to the north of the kingdom of Saxony; area, 9729 sq. miles. Originally a part of Saxony, it was given to Prussia by the congress of Vienna (1814). The northern and large portion belongs to the North German plain; the southern and southwestern is elevated or hilly, partly belonging to the Hartz mountain system, and containing the Brocken (3742 feet). The chief river is the Elbe. The soil is generally productive, about 61 per cent being under the plough and 20 per cent forests. Beet sugar is largely produced. The mineral products are valuable, particularly lignite, salt, kainite, and other potash salts. The capital of the province is Magdeburg; other towns are Halle (with a university), Erfurt, and Halberstadt. Pop. 2,832,616.

SAX'TON, Joseph, American inventor, was born at Huntingdon, Pa., in 1799. He invented a machine for cutting the teeth of chronometer wheels, and an escapement and compensating pendulum for clocks, and constructed a clock for the steeple of Independence hall, Philadelphia. Among his inventions are the mirror comparator for comparing standard measures, and a new form of machine for dividing them; the deep-

SCALE-FERN

sea thermometer, used by the United States Coast Survey in exploring the Gulf Stream; the self-registering tide gauge and the immersed hydrometer. He died in 1873.

SCAB, a skin disease in sheep, analogous to itch in man and mange in horses and dogs, usually propagated by contagion, and caused by the presence of minute acari, which burrow under the skin. Various medicines have been recommended, such as lard or palm oil, 2 lbs.; oil of tar, $\frac{1}{2}$ lb.; sulphur, 1 lb., mixed together and rubbed on the diseased spots.

SCABBARD FISH, a beautiful fish found in the Mediterranean and Eastern Atlantic, so called because in shape it bears some resemblance to the sheath of a sword. It is of a bright silvery whiteness, with a single dorsal fin running along its back.

SCAD, or **HORSE MACKEREL**, a genus of teleostean fishes included in the family Scomberidæ or mackerels, and



Scad.

found around the coasts of Britain. It appears in large shoals, and the flesh, although coarse, is esteemed and eaten salted during the winter months.

SCALDFISH, a marine flatfish, allied to the turbot, sole, and flounder.

SCALD-HEAD, a fungous parasitic disease of the scalp. See Favus.

SCALDS. See Burns and Scalds.

SCALE, a mathematical instrument consisting of a slip of wood, ivory, or metal, with one or more sets of spaces graduated and numbered on its surface for measuring or laying off distances, etc.

SCALE, in music, a succession of notes arranged in the order of pitch, and comprising those sounds which may occur in a piece of music written in a given key. In its simplest form the scale consists of seven steps or degrees counted upward in a regular order from a root or prime (the tonic or keynote), to which series the eighth is added to form the octave. It has been the practice among musicians to consider the scale having C for its keynote as the natural, model or normal scale. The diatonic scale ascends by five steps (tones) and two half-steps (semitones), taking for the names of the notes the syllables do, re, mi, fa, sol, la, si, do; the two semitones occur between E and F (mi and fa) and B and C (si and do). When the scale is graduated all the way by a series of twelve half-steps or semitones it is called the chromatic scale. A scale is said to be major when the interval between the keynote and the third above it as from C to E, consists of two tones; it is called minor when the interval between the keynote and its third, as from A to C, consists of a tone and a half. See Music.

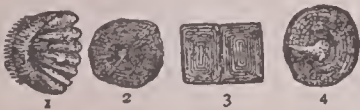
SCALE FERN, a popular name for a fern so named from the imbricated tawny scales at the back of the fronds.

SCALENE'

To this plant was formerly attributed a marvellous influence over the liver and spleen. It is a British species, and is said to be used as a bait for fish on the coast of Wales.

SCALENE', in mathematics, a term applied to a triangle of which the three sides are unequal. A cone or cylinder is also said to be scalene when its axis is inclined to its base, but in this case the term oblique is more frequently used.

SCALES, the imbricated plates on the exterior of certain animals, as the pangolins or scaly ant-eaters, serpents and other reptiles, and especially fishes. The scales of the latter are developed beneath the true epiderm, and consist of alternate layers of membrane, of horny matter, and occasionally of phosphate of lime. Fishes are sometimes classed, in accordance with the structure of their



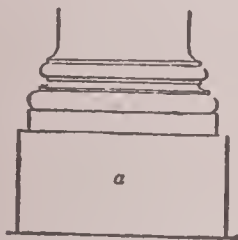
Scales of fishes.

1, Ctenoid scale of the perch. 2, Cycloid scale of the carp. 3, Ganoid scales of dipterus. 4, Placoid scale of ray.

scales, into Ctenoid, Ganoid, Cycloid, and Placoid, the general appearance and character of which are well shown in the accompanying figures. The term scale is applied also in botany to a small rudimentary or metamorphosed leaf, scale-like in form and often in arrangement, constituting the covering of the leaf buds of the deciduous trees in cold climates, the involucrum of the Compositæ, the bracts of catkins, etc.

SCALP, the outer covering of the skull, composed of skin and of the expanded tendon of the occipito-frontal muscle, and of intermediate cellular tissue and blood vessels. Hence the skin of the head or a part of it, with the hair belonging to it, torn or cut off by the American Indians as a mark of victory over an enemy.

SCAMIL'LUS, in ancient architecture, a sort of second plinth or block under a



a, Scamillus.

column, statue, etc., to raise it, but not, like a pedestal, ornamented with any kind of moulding.

SCANDINAVIA, the ancient name of the region now comprehending the three northern kingdoms, Denmark, Sweden, and Norway, or Sweden and Norway alone, and still not uncommonly used. These countries were inhabited in the earliest times by people of the Teutonic stock, and B.C. 100 the natives of Jutland and Schleswig became formidable to the Romans under the name of Cimbri. But it was chiefly in the 9th century that they made their power

felt in the western and southern parts of Europe, where hordes of Northmen or Vikings, as they were sometimes called, made repeated raids in their galleys on the coasts of England, Scotland, Ireland, Holland, Germany, France, Spain, and Italy, where they plundered, destroyed, and sometimes founded new states. The Old Norse or Scandinavian literature, so far as extant, is of considerable value, having preserved to us not only the old versification peculiar to all nations of Teutonic origin, but also the mythology, history, and laws of the pagan period of these northern countries. Among the most valuable remains are the Edda and the Sagas (which see).

SCANSO'RES, an order of birds, popularly known as climbing birds, having the feet provided with four toes, of which two are turned backward and two forward. Of the two toes which are directed backward one is the hallux or proper hind-toe, the other is the outermost of the normal three anterior toes. This conformation of the foot enables the scansores to climb with unusual



Scansores.

a, Head and foot of cuckoo. b, Do. of green woodpecker. c, Do. of great jacamar.

facility. Their food consists of insects and fruit; their nests are usually made in the hollows of old trees. The most important families are the cuckoos, the woodpeckers and wrynecks, the parrots, the toucans, the trogons, the barbets, and the plantain eaters. Not all of this order are actually climbers, and there are climbing birds which do not belong to this order.

SCAPEGOAT, in the Jewish ritual, a goat which was brought to the door of the tabernacle, where the high priest laid his hands upon him, confessing the sins of the people, and putting them on the head of the goat, after which the goat was sent into the wilderness, bearing the iniquities of the people. Lev. xvi.

SCAP'ULA, or **SHOULDER BLADE**, the bone which in most mammalia forms the chief bone of the shoulder girdle, and which chiefly supports the upper limb on the trunk or axial skeleton. In man the scapula exists as a flattened bone of triangular shape, which lies on each side of the body, on the back, and toward the upper and outer border of the chest or thorax. The internal surface of the scapula is concave, and is applied against the ribs. The outer or dorsal surface is divided into two portions by a

strong ridge which runs obliquely across the bone.

SCAP'ULARY, a kind of garment or portion of dress, consisting of two bands of woolen stuff—one going down the breast and the other on the back, over the shoulders—worn by a religieux. The original scapular was first introduced by St. Benedict, in lieu of a heavy cow for the shoulders, designed to carry loads.

SCARABÆ'US, an extensive genus of coleopterous insects, placed by Linnaeus at the head of the insect tribes, and answering to the section Lamelli cornes of Latreille. They are sometimes called dung-beetles, from their habit of inclosing their eggs in pellets of dung, which are placed in holes excavated for their reception. The S. sacer, or sacred beetle of the Egyptians, was regarded



Sacred beetle.



Natural size.

with great veneration; and figures of it, plain or inscribed with characters, were habitually worn by the ancient Egyptians as an amulet. Large numbers of these scarabæi or scarabs, made of hard stone or gems, are still found in Egypt, often inscribed with hieroglyphics. Some of the carved scarabs are three or four feet long. The beetle itself was also embalmed.

SCARBOROUGH, a municipal and parliamentary borough and seaport, England, county of York (North Riding), is beautifully situated on two open sandy bays separated by a bold promontory of rock 300 feet high, on the North sea, 39 miles northeast of York. Pop. 38,160.

SCARFING, a particular method of uniting two pieces of timber together



Various modes of scarfing.

by the extremities, the end of one being cut or notched so as to fit into the other,

making the part where the junction takes place of the same thickness as the rest of the pieces of timber.

SCARIFICATION, the operation of making several incisions in the skin with a lancet or scarificator for the purpose of taking away blood, letting out fluids, etc.; or the removal of flesh about a tooth in order to get at it the better with an instrument.

SCARLET FEVER, or **SCARLETINA**, is an extremely infectious disease, not confined to, but common among children. In ordinary cases the beginning of the disease is indicated by great heat and dryness of the skin, shivering, headache, sickness, and sore throat. Another symptom is that the tongue is coated with a white fur through which numerous red points stand up, from which appearance it is called the "strawberry tongue." On the second day of the fever a rash appears and quickly spreads over the whole body, begins to fade on the fifth day, and disappears before the end of the seventh. After the rash has gone the skin begins to be shed in large flakes, and this continues about five weeks. During this latter stage the disease is most infectious. At the first symptoms the patient should receive a dose of castor-oil, and then be put in a warm bath. When the fever has gone, strengthening food and frequent bathing should be given, and an equal temperature in the room observed.

SCARP, in fortification, the interior slope or talus of the ditch next the fortified place and at the foot of the rampart.

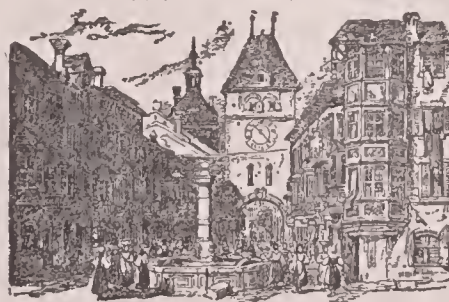
SCAUP DUCK, a species of duck common in North America and the north of Europe; and is found in considerable numbers on the British coasts during the winter months. It feeds on small fish, molluscs, and hence its flesh is coarse.

SCEPTICISM, in the wide sense, that condition of mental conflict in the search for truth which involves suspension of judgment before opposing testimony. Specifically, however, it has been applied to the doctrines of the Greek philosophers called Pyrrhonists, whose scheme of philosophy denied the possibility of knowing anything with certainty. Pyrrho of Elis (360-270 B.C.), although he himself left no writings, was the founder of this school. Chief among his immediate disciples was Timon of Phliut, who taught that appearances are neither false nor true, that logical reasoning has no adequate sanction, and that imperturbability is the only possible attitude before the facts of life. This position was maintained by the founders of the Middle Academy, Arcesilaus and Carneades, who employed this philosophy of doubt against the dogmatism of the Stoics. Arcesilaus, who lived about 315-241 B.C., held that the report of our senses is untrustworthy. Carneades (213-129 B.C.) declared absolute knowledge to be impossible, and was the author of the doctrine of probability. To the later sceptical school of the 1st century B.C. belongs Ænesidemus of Cnossus, who expressed his doctrine of negation in ten tropes. These were reduced to five by Agrippa, the first of which is connected with the

irreconcilability of human testimony; the second is based on the principle that every proof requires to be itself proved; the third that knowledge varies according to the conditions under which it is acquired; the fourth forbids the assumption of unproved opinion; and the fifth seeks to discredit the reciprocal method of proof in which one thing is proved by another and then the second adduced to prove the first. In later times Al-Ghazzali (1059-1111) taught at Bagdad a philosophic scepticism to enforce the truth of his Mohammedan doctrine. In this method he was followed by Pascal (1623-1662), who sought to establish the necessity of Christian faith by a sceptical exposure of the fallacy of human reason. Among modern sceptics may be mentioned Montaigne, Bayle, D'Alembert, and Hume. The latter limited the range of human reasoning to human experience, and affirmed that any knowledge concerning God or a future state transcends the scope of our faculties. See Agnostics.

SCHAFF (sháf), Philip, D.D., biblical scholar, born in Switzerland in 1819. He was professor in the theological seminary of the German Reformed church at Mercersburg (Pa.) from 1844 to 1863. He was a prolific writer, his works including *History of the Apostolic Church*; *History of the Christian Church*, *Creeks of Christendom*, *Religious Encyclopedia* (as editor), etc. He died in 1893.

SCHAFFHAUSEN (sháf'hou-zn), a town of Switzerland, capital of the canton of same name, situated on the right bank of the Rhine, 24 miles north of Zürich. It is remarkable for the antique architecture of its houses. About 3 miles below the town are the celebrated falls which bear its name, and by which the whole volume of the Rhine is precipitated over a height of more than 70



Street in Schaffhausen.

feet. Pop. 15,597.—The canton is the most northerly in Switzerland, and is situated on the right or German side of the Rhine; area, 116 sq. miles. The surface is very much broken, being traversed throughout by a series of ridges which ramify from the Jura. The only river is the Rhine. The inhabitants are generally Protestants, and the language spoken is principally German. Pop. 41,514.

SCHÉELE (shā'lè), Karl Wilhelm, Swedish chemist, born in 1742; died in 1786. He discovered tartaric acid, chlorine, baryta, oxygen shortly after Priestley, glycerine, and arsenate of copper, called Scheele's-green.

SCHÉELE'S-GREEN, a green pig-

ment consisting of a pulverulent arsenate of copper, first prepared by Scheele (see above); it is used both in oil and water-color painting.

SCHELLING (shel'ing), Friedrich Wilhelm Joseph von, a German philosopher, born at Leonberg, Württemberg, in 1775; died 1854. He studied at Tübingen, for a short time also at Leipzig, and from thence proceeded to Jena. His philosophical studies were mainly guided by Fichte, of whom he was first a colleague, and afterward successor. The principal writings of Schelling are: *Ideas for a Philosophy of Nature* (1797); *The Soul of the World* (1798), *First Sketch of a System of the Philosophy of Nature* (1799), *System of Transcendental Idealism* (1800), *Exposition of My System of Philosophy*, published in the *Journal of Speculative Physics*, edited by him (1801-3); *Bruno, or the Divine and Natural Principle of Things* (1802), *Critical Journal of Philosophy* (in conjunction with Hegel), 1802-3; *Exposition of the True Relation of the Philosophy of Nature to the Amended Theory of Fichte* (1806).

SCHENCK, Robert Cumming, diplomatist, was born in Franklin, Ohio, in 1809. He served three terms in congress. His first diplomatic mission was to Brazil, where he was sent in 1857. He received the first appointment of brigadier-general from President Lincoln, his commission being dated May 17, 1861. He was wounded at the second battle of Bull Run, and in 1862 was promoted to the rank of major-general. He was again sent to congress in 1866, and in 1870 he was appointed minister to Great Britain. He died in 1890.

SCHENEC'TADY, a city of New York, capital of the county of the same name, on the Mohawk river, about 17 miles from Albany. It is the seat of Union college, incorporated in 1794, and one of the most successful in the states. The Erie canal and the Delaware and Hudson canal pass through the city. It has manufactories of locomotives, shawls, etc., besides woolen and flour mills. Pop 1909, about 77,000.

SCHILLER, Johann Friedrich Christoph von, one of the greatest of German poets, was born at Marbach, Württemberg, in 1759. He published his play, *The Robbers*, at his own expense in 1781; it excited an immense amount of attention, and in 1782 it was performed at Mannheim. In 1785 he went to Leipzig and Dresden, where he studied the history of Philip II. In this way he prepared himself not only to write his drama of *Don Carlos*, which appeared in 1787, but also to publish a *History of the Revolt of the Netherlands* (1788). Visiting Weimar in 1787 he received friendly welcome from Wieland, Herder, and Goethe, the latter assisting to procure him (1789) a professorship of philosophy at Jena. Here he lectured on history, and began to publish *Historical Memoirs from the Twelfth Century to the Most Recent Times* (1790); and his *History of the Thirty Years' War* appeared in 1790-3. His first periodical, *Thalia*, begun in 1784 at Mannheim, having ceased in 1793, he formed a plan of publishing a new periodical, *Die Horen* (The Horæ or Hours). He had

long been in weak health, and being attacked by fever died in 1805. His correspondence with Goethe, William von Humboldt, and C. G. Körner has been published, his life has been written by Carlyle, and of his works there is among others an English translation in Bohn's library.

SCHIST (shist), a geological term applied to rocks which have a foliated structure and split in thin irregular plates, not by regular cleavage, as in the case of clay-slate, nor in laminæ, as flagstones. It is properly confined to metamorphic or crystalline rocks consisting of layers of different minerals, as gneiss, mica-schist, hornblende-schist, chlorite-schist, etc.

SCHLANGENBAD (shlång'en-bât), a watering-place of Prussia, in Hesse-Nassau, 6 miles w.n.w. of Wiesbaden, among wooded hills. It consists chiefly of lodging houses, and two large bathing establishments. The water has a temperature of from 80° to 88°, and is beneficial in hysteria, neuralgia, rheumatism, gout, paralysis, etc.

SCHLEGEL (shlā'gel), August Wilhelm von, a distinguished German scholar, born at Hanover 1767, died at Bonn 1845. He wrote various poems and ballads, delivered lectures on literature and art, published a tragedy called *Ion*, translated the most of Shakespeare's and Calderon's plays into German, and devoted the latter part of his life to oriental studies and the translation of various works from Sanskrit.

SCHLEGEL, Karl Wilhelm Friedrich von, brother of the foregoing, born 1772, died 1829. Besides the lectures which he published his chief works are: *History of the Old and New Literature*, *Philosophy of Life*, *Philosophy of History*, and the *Philosophy of Language*. His wife, a daughter of Moses Mendelssohn, was the author of some works published under Schlegel's name.

SCHLEIERMACHER (shli'er-mäh-er), Friedrich Ernst Daniel, German Protestant theologian and philosopher born at Breslau 1768, died at Berlin 1834. The works of Schleiermacher, besides numerous sermons, include: *Outlines of a Critique of Ethics as Heretofore Taught*, *Translation of Plato's Works*, *Christian Belief According to the Fundamental Doctrines of the Evangelical Church*, *Sketch of a System of Morals*, *Philosophical Ethics*, *Dialectics*, *Æsthetics*, etc.

SCHLESWIG-HOLSTEIN, since 1866 a province of Prussia, bounded on the north by Denmark; east by the Baltic, Lübeck, and Mecklenburg, south by Mecklenburg and the territory of Hamburg; southwest by the Elbe; and west by the North sea; area, 7273 sq. miles. Schleswig is the portion lying north of the Eider; Holstein that south of this river. Schleswig-Holstein forms part of the same peninsula with Jutland, to which in its general character it bears considerable resemblance. There are extensive moorlands; the west coast consists of sandy and marshy flats, protected in Schleswig by chains of islands, in Holstein by lofty dykes; the east coast is scooped out into natural harbors; the principal streams flow to the west, toward which for the most part

the country slopes. Lakes are numerous. Schleswig is separated from Holstein by the river Eider and the Schleswig-Holstein canal. The Eider is the principal river. The country is fertile, and is chiefly agricultural. The great majority of the inhabitants are of German origin. The principal towns are Altona, Kiel, Flensburg, and Schleswig, the capital. Schleswig-Holstein, which became a united duchy in 1386, passed over to Denmark in 1773, and was appropriated by Prussia after the war of 1866. Pop. 1,387,587.

SCHLEY (shlā), Winfield Scott, a naval officer, was born in Frederick co., Md., October 9, 1839. He was graduated at the Naval academy and served on the frigate *Niagara*. On July 16, 1862, he was made a lieutenant, and from that time on he alternated between active service in different parts of the world and as instructor at the Naval academy. In 1884 he was sent by the United States government to find Greely. After a journey through 1400 miles of ice he found Greely and six companions at Cape Sabine, Grinnell Land. He was appointed commodore in 1898. When war was declared against Spain he was placed in charge of the flying squadron and ordered to find and destroy the Spanish fleet under Admiral Cervera. When the Spanish fleet attempted to escape from the harbor of Santiago it was completely destroyed in a running fight, by the American blockading squadron, which, during the temporary absence of Samson, was under the command of Schley. On August 10th he became a rear-admiral, and was appointed a member of the commission to arrange for the evacuation of Porto Rico by the Spanish. He retired from active service October 9, 1901. Schley wrote in collaboration with James Russell Soley, *The Rescue of Greely*.

SCHLIEMANN (shle'mân), Heinrich, German archæologist, born in 1822. He traveled widely and acquired many languages, and having made a fortune commenced a series of archæological investigations in the East. In 1869 he published at Paris his *Ithaque, Le Péloponnèse, Troie: Recherches Archæologiques*, an account of his travels in these regions, and this was followed in 1874 by his *Trojanische Alterthümer*, giving the results of his researches and excavations on the plateau of Hissarlik, the alleged site of ancient Troy. In 1875 he commenced excavations at Athens and Mycenæ, and in 1877 discovered the five royal tombs which local tradition in the time of Pausanias asserted to be those of Agamemnon and his companions. Many treasures of gold and silver were brought to light. His *Mycenæ*, a narrative of researches and discoveries of Mycenæ and Tiryns, was published in 1877, with a preface by Gladstone. He received valuable assistance in his investigations from his wife, who is a native of Greece and an accomplished scholar. His *Troja* and his *Tiryns* are in a measure supplementary to his earlier works on Troy and Mycenæ. He died in 1890.

SCHOFIELD, John McAllister, American soldier, was born in Chatauqua co., N. Y., in 1831. Soon after the outbreak

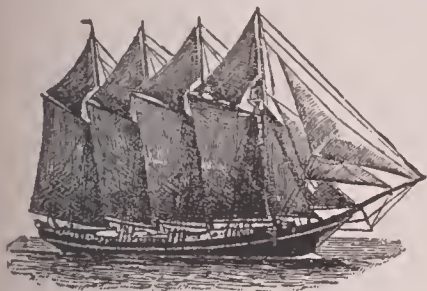
of the civil war he was appointed brigadier-general of volunteers. In 1864 he joined the army of General Sherman, and bore a prominent part in all its operations until the close of the war. In 1868, he was appointed secretary of war; but he resigned in March, 1869, and was assigned to the command of the department of Missouri, and in 1870 to that of the Pacific. From 1876 to 1881 he was superintendent of the Military academy at West Point. In 1882 he was placed in command of the department of the Pacific, from which he was transferred in April, 1886, to the division of the Atlantic, and upon the death of Gen. P. H. Sheridan, August 5, 1888, succeeded to the command of the United States army. In 1895 he retired with the rank of lieutenant-colonel. He published *Forty-six Years in the Army*. He died in 1906.

SCHOLASTICISM, the name given to the system of philosophy taught by the philosophers of the middle ages, who were called scholastics or schoolmen from the circumstance that their philosophy originated in the schools instituted by and after Charlemagne for the education of the clergy. The first period of the schoolmen may be considered as extending from the 9th to the 13th century, and is characterized by the accommodation of the Aristotelian logic, and of Neo-Platonic philosophemes to the doctrines of the church. The period begins with John Scotus Erigena, and numbers, among other names, those of Berengarius of Tours and his opponent Lafranc, Anselm, archbishop of Canterbury, Roscellinus, Abelard, Peter Lombardus, and John of Salisbury. The period is marked by the controversies that raged between the Nominalists and the Realists, and which terminated at length in the triumph of the latter. The second period of scholasticism, extending from the 13th to the 15th century—from Alexander of Hales to the close of the middle ages, when classical studies were revived and the sciences of nature and human nature began once more to be studied, presents us with the complete development of scholasticism, and also with its dissolution. During this period the Aristotelic philosophy exercised a more marked influence; Realism was also triumphant, until, towards the end of the period, William of Occam rose up as the champion of Nominalism, and in distinguishing thought from being, and the theoretical from the practical, gave to philosophy a wider range and a freer spirit. The zenith of scholasticism is constituted by Thomas Aquinas a Dominican (died 1274), and Duns Scotus, a Franciscan (died 1308), who were the founders of the two schools into which the entire movement was thenceforward divided.

SCHOOLCRAFT, Henry Rowe, an American ethnologist and geologist, born at Guelderland, in Albany co., New York, 1793. In 1820 he was appointed geologist to the expedition despatched by the government to explore the sources of the Mississippi, and in 1821 was appointed secretary to an Indian conference at Chicago. In 1832 he conducted a government expedition to the Upper Mississippi, in the course of which he explored the sources of that river.

In 1836 he negotiated the purchase for government of 16,000,000 acres in this region, and after this he was appointed acting superintendent of Indian affairs for the northern department. In 1847 he was appointed by the government to prepare an extensive work on the Indians, which appeared under the title of *Historical and Statistical Information respecting the History, Condition, and Prospects of the Indian tribes of the United States* (1851-57). His other works are: *Algie Researches*, comprising inquiries respecting the Mental Characteristics of the North American Indians; *Thirty Years with the Indian Tribes of the Northwestern Frontier*, *The Indian in His Wigwam*, and the *Myth of Hiawatha* and other Legends, besides poems, lectures, reports, etc. For his *Lectures on the Indian Languages* he received the gold medal of the French Institute. He died in 1864.

SCHOONER, a small fast-sailing sharp-built vessel with two masts, and the principal sails of the fore-and-aft type. There are two chief kinds of schooners, the top-sail schooner and the fore-and-aft schooner, the former carrying a square top-sail and top-gallant



Four-masted schooner.

sail (with sometimes a royal) on the fore-mast, and the latter having fore-and-aft sails on both masts, with sometimes a square sail on the fore-mast. The first schooner is said to have been launched at Gloucester, Massachusetts, in 1713. A three-masted schooner carries fore-and-aft sails on each mast.

SCHOPENHAUER (shō'pen-hou-er), Arthur, a German philosopher, born at Danzig 1788. From 1814 to 1818 he lived at Dresden, and occupied himself principally with the preparation of his most important work—*The World as Will and Idea*. Previous to this he had published a work on optics 1816. In 1818 he visited Rome and Naples, and from 1822 to 1825 was again in Italy, returning in the latter year to Berlin. The final teaching of Schopenhauer is that of a philosophic pessimism, having as its ideal the negation of the will to live. He died in 1860.

SCHOTTISCHE (shot-tish'), a dance performed by a lady and gentleman, somewhat resembling a polka; it is in $\frac{3}{4}$ time.

SCHUBERT (shō'bert), Franz, one of the greatest composers of modern times, born at Vienna in 1797, the son of a teacher; commenced his musical education in his seventh year, and in 1808 was admitted among the choristers of the court chapel. His songs and ballads, as exemplified in his three principal

collections, the *Winterreise* (1826-27), the *Müllerlieder* (1828), and the *Schwanengesang* (1828), may be said to have revolutionized the Lied in making the accompaniment not less interpretative of the emotions of the poem than the vocal part, and in breaking through the limitations of the old strophic method. Besides his six hundred songs he left about four hundred other compositions, including fifteen operas, six masses, and several symphonies. Two only of the operas, *Rosamond* and the *Enchanted Harp*, were performed during his life, and they are considered inferior to his unproduced *Fierabras*. His symphonies take a higher rank, the Seventh (in C major) being ranked by Mendelssohn and Schumann with Beethoven's. His entire work justifies Liszt's description of him as the most poetic of musicians. He died in Vienna in 1828.

SCHUMANN (shō'màn), Robert, musical composer and critic, born at Zwickau in the kingdom of Saxony in 1810. Prior to 1840 his principal works were the *Fantasias*, the *Scenes of Childhood*, the *Etudes Symphoniques*, the *Kreislarian*, the *Abegg variations*, the *Papillons*, the *Carnival*, and two sonatas in F sharp minor and G minor. He then commenced his great series of orchestral works, his symphony in B flat being first performed at the close of 1841. It was followed by his *Overture*, *Scherzo* and *Finale*, his D minor symphony, three quartets, the piano quintet and quartet, the cantata *Paradise* and the *Peri*, the C major symphony (1846), *Genevieve* (1847), *Manfred* (1848), the *Faust music* (1850), the E flat symphony (1851), and other works. Under stress of work, however, his reason failed him, and after an attempt to drown himself in 1854 he was confined in a lunatic asylum, where he died in 1856. In the line of musical descent Schumann stands between Beethoven and Wagner.

SCHUYLKILL (sköl'kil), a river of the United States, in Pennsylvania, which rises in the north side of the Blue mountains, runs southeast, passes through the confines of Philadelphia, and unites with the Delaware 7 miles below that city. It is 140 miles long, and navigable for boats of 300 or 400 tons to Philadelphia.

SCHUYLER, Philip John, American general, was born at Albany, N. Y., in 1733. He reached the rank of major in the French and Indian war, and at the beginning of the revolutionary struggle was made one of the American major-generals. He took the leading part in preparing to meet Burgoyne's expedition in 1778; but troops had to be called in from other states, and he was subjected to jealousies which thwarted him at every step. Nevertheless, his arrangements were so complete that he had really checkmated Burgoyne before congress superseded him in the command by the appointment of Bates, who reaped all the glory which should have accrued to Schuyler. Retiring from the army, he served for three years in the continental congress, and in the United States senate, 1789-91, and 1797-98. He died at Albany, November 18, 1804.

SCHURMAN (shur'màn), Jacob Gould, American educator, was born at Free-

town, Prince Edward island, in 1854. In 1891 he was appointed dean of the Sage School of Philosophy at Cornell, and he succeeded Charles Kendall Adams as president of the university in 1892. He became editor of the *Philosophical Review* in 1892. In January, 1899, he was appointed by President McKinley chairman of the first Philippine commission, and spent the greater part of the succeeding year in the Philippine islands. He received a diploma and was appointed a life member of the American Academy in Rome in 1905. Among his works are *Kanteian Ethics* and the *Ethics of Evolution*, *The Ethical Import of Darwinism*, *Report of the Philippine Commission*, etc.



Carl Schurz

SCHURZ (shurts), Carl, German-American soldier and political leader, was born at Liblar, Prussia, in 1829. He was engaged in the revolutionary movement of 1848-49, as a result of which he was forced to retire to Switzerland. In 1852 Schurz came to the United States, remained in Philadelphia for two years, and then settled in Wisconsin. In 1861 he was appointed minister to Spain, where he remained till December, 1861; returning to the United States, he entered the army, and in the May following was appointed brigadier-general of volunteers. He took part in the second battle of Bull Run, and commanded a division in the battles of Chancellorsville and Gettysburg. In the autumn of 1863 he went to Tennessee, and took part in several battles, but resigned in 1865. In 1868 he removed to St. Louis and in 1869 was elected United States senator from Missouri. In 1877 he was appointed secretary of the interior by President Hayes. At the expiration of his term, 1881, he removed to New York, and was the editor of the *Evening Post* until August, 1883. In 1884 he took a leading part in opposing the election of James G. Blaine and advocating that of Grover Cleveland. Schurz was an enthusiastic advocate of civil-service reform, in sup-

port of which he wrote many articles and reports and delivered many speeches. His publications include biographies of Henry Clay (1887) and of Abraham Lincoln (1891). He died in 1906.

SCHWAB, Charles M., first president of the United States Steel corporation and later president and chief owner of the Bethlehem Steel co., was born at Williamsburg, Pa., in 1862. In 1887 he was appointed superintendent of the Homestead works and under him these works were reconstructed and made the largest in the world. In 1889 he became general superintendent of the Edgar Thomson works. He was made president of the Carnegie Steel company in February, 1897. When the United States Steel corporation was formed he was made president at Mr. Carnegie's suggestion. He retired in 1904 to become president of the Bethlehem Steel company in which he owns a majority interest.

SCHWANN, Theodore, M. D., a German physiologist, was born at Neuss, in the Rhine provinces, December 7, 1810. Doctor Schwann spent forty years in important work in connection with anatomy, and made some very valuable discoveries, one of them being that of the presence of pepsin in the gastric juice. He died at Cologne, January 11, 1882.

SCHWANTHALER (shvân'tā-ler), Ludwig Michael, German sculptor, born at Munich in 1802, where his father, the court sculptor, died in 1821. On the death of his father he succeeded him, and executed various commissions for King Maximilian, and a great number for his successor King Ludwig. He died in 1848. Schwantaler was the chief representative of the "romantic" school in sculpture, and his works are often deficient in truth to nature and reality.

SCHWARZBURG - RUDOLSTADT (shvarts'byrh-rö-dol-stät), a German principality, consisting of several isolated portions, situated between Prussian Saxony, the Saxon duchies, and the principality of Reuss. It lies on the northern side of the Thuringian Forest, and has an area of 362 sq. miles. The surface is rugged, and the soil by no means fertile. The most important crop is flax, the culture of which is almost universal. A great part of the land is devoted to pasture, and great numbers of cattle are reared. The minerals include brown coal, iron, slate, and salt. The principal manufactures are glass and porcelain. The capital is Rudolstadt. Pop. 93,059.

SCHWARZBURG-SONDERSHAUSEN, a German principality on the northern side of the Thuringian Forest, between the territories of Prussian Saxony and the Saxon duchies, and consisting of several distinct portions; area, 332 sq. miles. One of the principal sources of revenue is derived from the forests, which furnish excellent timber. The only manufacture of any importance is porcelain. The capital is Sondershausen. Pop. 80,898.

SCHWATKA, Frederick, explorer, was born at Galena, Ill., September 29, 1849. In June, 1878, he sailed to the Arctic regions, in command of the Franklin search party, which returned

in September, 1880, having discovered and buried many of the skeletons of Sir John Franklin's lost party, and cleared up much of the mystery that had shrouded their fate. He later explored the course of the Yukon river (1884). In 1890 Lieutenant Schwatka made an exploring expedition to Mexico. His works are: *Along Alaska's Great River*, *Nimrod in the North*, *Children of the Cold*. He died in 1892.

SCHWYZ (shvêts), a central canton of Switzerland, bounded on the north by the Lake of Zürich and canton St. Gall, west by Zug and Luzern, south by Lake Luzern, and east by Glarus; area, 353 sq. miles. Schwyz being the most important of the cantons which first threw off the yoke of Austria, gave the name to the whole confederation. Its present government is an extreme democracy, the whole power, legislative and executive, being lodged in the male population of legal age, who hold a general assembly every two years. Pop. 55,497.

SCIAT'ICA, a term used in medicine to denote a rheumatic affection, in which the pain stretches along the course of the great sciatic nerve, that is, from the hip along the back part of the thigh toward the ham of the leg. There is stiffness and pain, increased by any change of temperature and moisture; there is generally swelling of the limb at the commencement of the disease, but after repeated attacks the limb seems to shrink, owing to the wasting of the muscles. In some cases the articulation of the hip seems affected, and permanent immobility of the limb takes place.

SCIENCES, a term applied to the generalized and systematized divisions of knowledge. Science and philosophy resemble each other in so far as they both have to do with knowledge; but while the latter deals with the whole sum of knowledge, the former takes up special branches of it, and it does not necessarily go back to first principles like philosophy. Given a sufficient number of inter-related facts, they may be so arranged and classified, by referring them to the general truths and principles on which they are founded, as to constitute a well-certified and more or less complete branch of knowledge, that is, a science. The sciences are broadly divided into pure or theoretic sciences and applied or practical sciences, the latter being definable as the knowledge of facts, events, or phenomena as explained, accounted for, or produced by means of powers, causes, or laws; the former as the knowledge of these powers, causes, or laws, considered apart or as pure from all applications. To the class of pure or fundamental sciences belong mathematics, physics, chemistry, psychology, and sociology; to the applied or concrete belong geology, mineralogy, botany, zoology, meteorology, geography, ethics, politics, law, jurisprudence, logic, grammar, rhetoric, philology, and political economy; navigation, engineering, and practical mechanics; surgery, midwifery, materia medica, etc.

SCILLY ISLANDS (sil'i), a group of granitic islands belonging to England,

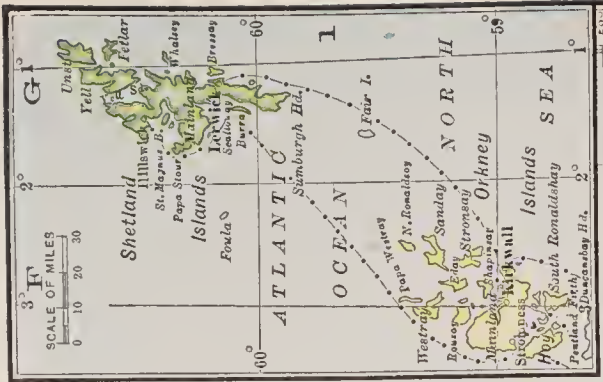
forming part of the county of Cornwall, at the entrance to the English channel, about 30 miles west by south of Land's End. They rise abruptly from a deep sea, form a compact group about 30 miles in circumference, and are said to amount altogether to about 140 in number (total area 3560 acres); but there are only six of any importance, the remainder being mere rocks and islets. The six alluded to are St. Mary's, St. Agnes, St. Martin, Trescow, Bryher, and Sampson. Pop. 2096.

SCIMITAR, a kind of sword in use among eastern nations. The blade is nearly semi-circular in form, with the edge upon the convex side. This form, while ill adapted for thrusting, is admirably adapted for striking.

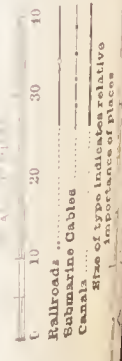
SCIO, or **SKIO** (si'ō; skē'ō), an island of Asiatic Turkey, in the Ægean sea, separated from the coast of Asia Minor by a channel not more than 7 miles wide where narrowest, and about 53 miles west of Smyrna. Before the war of Greek independence Scio was peopled almost entirely by Greeks, of whom large numbers were massacred by the Turks after their subjugation in 1822. Scio contends for the honor of having given birth to Homer. It possesses few antiquities. In April, 1881, the island suffered much from repeated shocks of earthquake. Pop. 70,000.

SCIP'IO AFRICA'NUS, The Elder, Publius Cornelius Scipio Africanus Major, one of the most illustrious of Roman warriors, was born about 235 B.C. In 212 B.C. he was unanimously elected ædile, and a few years after was appointed proconsul in Spain. His first successful enterprise of importance was the conquest of New Carthage, the stronghold of the Carthaginians in Spain. The next year (209 B.C.) Scipio totally defeated Hasdrubal, Hannibal's brother, and subsequently a fresh army, led by Mago and Hasdrubal the son of Gisco. The result was to drive the Carthaginians wholly from Spain, and Scipio was empowered to lead an army against Carthage herself. The Carthaginians recalled Hannibal from Italy, but the great battle of Zama, fought 19th October, 202 B.C., resulted in the total defeat of the Carthaginians, who, on the advice of Hannibal, sought for peace. On his return to Rome Scipio was honored with a triumph, and received the surname of Africanus. He died, it is believed, in B.C. 183, the same year as his great opponent Hannibal.

SCIP'IO AFRICA'NUS, The Younger, Publius Cornelius Scipio Æmilianus Africanus Minor, son of L. Æmilius Paullus, the conqueror of Macedonia, and adopted son of P. Cornelius Scipio, the son of Scipio Africanus Major, was born about 187 B.C. In B.C. 152 he accompanied the consul Lucius Licinius Lucullus to Spain as military tribune, and in B.C. 149, on the outbreak of the third Punic war, commanded in Africa under the consul M. Manlius Nepos. His services were so important that in B.C. 147, contrary to the usual custom, not being of the legal age, he was unanimously chosen consul and leader of the forces against the Carthaginians. In B.C. 146 he took, and by command of the senate burned Carthage, for which



SCOTLAND



he was honored with a triumph at Rome and with the surname of Africanus. He was found dead in his bed in B.C. 129, Carbo being suspected of having murdered him. He was a friend of Polybius, the historian, and a patron of Terence.

SCIRPUS. See Bulrush.

SCISSORBILL, a genus of Laridæ or gulls, so named from the possession of an elongated beak of compressed form, the lower mandible exceeding the upper one in length, and shutting into the latter somewhat after the fashion that the blade of a knife does into its handle. This curious beak is of an orange color at its base, and black at its tip. The bird, which inhabits the coasts of America, and Africa is a dark brown on the upper aspect of the head and body; the under surface white, and a band of white across the wings. The average length of the scissorbill is about $1\frac{1}{2}$ foot.

SCORE, in music, the original draught or its transcript, of a musical composition, with the parts for all the different voices or instruments arranged and placed in juxtaposition; so called from the practice of drawing the bar through all the parts.

SCORPION, the name of animals of the class Arachnida (which includes also the spiders). The largest of their class. Scorpions have an elongated body suddenly terminated by a long slender tail formed of six joints, the last of which terminates in an arcuated and very acute sting, which effuses a venomous liquid. This sting gives rise to excruciating pain, but is usually unattended either with redness or swelling, except in the glands of the arm-pit or groin. It is very seldom, if ever, fatal to man. The animal has four pairs of limbs borne by the thorax or chest-segments, and the maxillary palpi (organs of touch belonging to the maxillæ or lesser jaws) are



Scorpions.

largely developed, and constitute a formidable pair of nipping claws. With these claws they seize their insect prey, which is afterward killed by the sting. The eyes, which are of the simple kind number six, eight, or twelve. The female scorpions are said to exhibit great care for their young, and carry them on their backs for several days after being hatched, while they tend them carefully for about a month, when they are able to shift for themselves. Scorpions generally live in dark places, and under stones. They are found in the south of Europe, in Africa, in the East Indies, and in South America.

SCORPION FISH, or **SEA SCORPION**, a genus of teleostean (acanthopterous) fishes, belonging to the Triglidae or gurnard family. The first dorsal fin possesses eleven spines, the second dorsal

possessing one spiny ray and nine or ten soft rays. The anal fin is short, and has three spines and five soft rays. The red scorpion-fish is a familiar form. The spotted scorpion-fish is a second species, and, like the preceding form, occurs in British waters, as well as in the Mediterranean, Atlantic, and the tropical seas.

SCORPION FLY, a genus of insects belonging to the order Neuroptera, or that of the dragon flies. The name scorpion fly is derived from the appendages seen attached to the abdomen of some species. The male in the common species, for example, has the sixth and seventh joints of the abdomen attenuated, and capable of extensive motion; while the last joint forms a pair of forceps resembling those of the earwigs. When at rest this tail is curled over the back, but when irritated the forceps are used as weapons of offense or defense.

SCOTLAND, the northern division of the Island of Great Britain, between lat. $54^{\circ} 38'$ and $58^{\circ} 40' 30''$ N.; and lon. $1^{\circ} 46'$ and $6^{\circ} 8' 30''$ W. It is separated from England substantially by the Solway, Cheviots, and Tweed, the border isthmus being about 60 miles across; but the irregular boundary line measures fully 100 miles. On all other sides it is bounded by the sea. Few points in the mainland are more than 40 miles from the sea, the country being so much penetrated by inlets. The country was formerly divided into a number of districts, many of the names of which are still familiar, such as Lothian, Tweeddale, Galloway, Breadalbane, etc., but for political purposes is now divided into 33 counties, of which Lanark, Edinburgh, Aberdeen, Forfar, Ayr, Fife and Renfren are the most important. Pop. 4,772,103. Edinburgh (the capital); Glasgow, Dundee, and Aberdeen each contain upward of 100,000 inhabitants. After these come, in order of population, Paisley, Leith, Greenock, Coatbridge, Kilmarnock, Kirkcaldy, Perth, Hamilton, Motherwell, and Falkirk.

The islands of Scotland number altogether nearly 800. On the east coast they are few and small; but on the northeast are the two large groups of the Orkneys and Shetlands, the former numbering 52 islands, 28 permanently inhabited; the latter 100 islands, 29 inhabited; while on the west coast the islands are large and numerous. Here the Hebrides extend for 200 miles from north to south, and are divided into the Inner and Outer Hebrides, the former lying close to the western coast of the mainland and stretching from Skye to Islay; the latter, parted from the Inner Hebrides by the straits of the Minch and the Little Minch, comprise the long chain of islands from Lewis to Benbecula. Inclosed in the Firth of Clyde are the islands of Arran, Bute, and the Cumbraes, forming a county by themselves. The west coast of the mainland is generally a wild, deeply-indented mountain-wall, presenting a series of inlets or sea lochs, while toward the middle the coast is cleft by two great inlets with openings to the southwest, the Firth of Lorn and its continuation Loch Linnhe, and the Firth of Clyde and its ramifications running far inland. The east coast

is sometimes low and sandy, but is often formed of steep rocky cliffs of considerable elevation, the chief inlets being the Firths of Forth and Tay, and the Moray Firth, Cromarty Firth, etc.

Both from the configuration of the surface and the geological structure the country divides into three divisions, the Highlands, Central Lowlands, and Southern Uplands. The first of these divisions lies north of a line stretching in a S.W. direction from the coast of Kincardineshire to the Firth of Clyde; the third is the country S. of a line drawn from Dunbar southwesterly to Girvan; the country between these lines forms the Central Lowlands.

The chief rivers flow to the east, and enter the German ocean, the largest being the Tweed, Forth, Tay, South Esk, North Esk, Dee, Don, Deveron, Spey, Findhorn, etc.; those entering the sea on the west are the Clyde, Ayr, Doon, Dee, Nith, Annan, and Esk. The Clyde, however, in its lower course carries a vast traffic, this being rendered possible chiefly by dredging. Many of the rivers are valuable from the numbers of salmon they produce. A striking feature of the country is the great multitude of lakes, varying in size from Loch Lomond (28 sq. miles) to the pool-like mountain tarns. In the Northern Highlands almost every glen has its lake and every mountain hollow is filled by a stream or spring.

For Agriculture, Manufactures, Trade, etc., see Britain.

The parliament of Scotland anciently comprised all who held any portion of land, however small, from the crown by tenure of military service; till the reign of James VI., when the small barons or freeholders were excused from attendance in person, "two or more wise men," being deputed from each county in proportion to its size. Its powers were nominally extensive, but the supreme power was virtually in the king, who by his influence often entirely controlled its proceedings. The parliament in the whole consisted of three estates—the nobility, the dignified clergy (consisting of bishops, abbots, and priors), and the lesser barons, or representatives of shires and burghs. When Presbyterianism was formally ratified by law after the revolution of 1688, the ecclesiastical estate ceased to have a place in parliament. Every measure brought before parliament was previously prepared by a committee, styled the lords of the articles, chosen from each of the three orders, but in effect little better than royal nominees. Before the Union there were four great officers of state—the lord high-chancellor, the high-treasurer, the lord privy-seal, and the secretary; and there were also four lesser officers—the lord clerk-register, the lord-advocate, the treasurer-depute, and the justice-clerk. Previously to the era of the Revolution the privy-council of Scotland assumed inquisitorial powers, and even torture was administered under the sanction of its authority; but it is now entirely merged in the privy-council of Great Britain. The number of peers in the Scottish parliament was latterly 160, and of commons 155, and all sat in one house, and voted promiscuously.

At the union of the kingdoms the political system of Scotland was almost entirely incorporated with that of England.

Scotland has had the advantage of a national system of elementary education for over two centuries, a school having been established in every parish by a law of 1696 (where such a school was not already established), according to a system proposed by John Knox long before. This scheme did effective service for the education of the people, till the great increase of population, especially in towns, rendered it unequal to the task laid upon it, and this notwithstanding the erection of many schools by various religious denominations. By the passing of the Education Act of 1872 board-schools have superseded the old parish schools, there being also numerous grammar or high schools and academies in every town of any size, though no systematic scheme of secondary education. Other institutions are the normal or training schools and colleges of the different religious bodies and the four universities of Edinburgh, Glasgow, Aberdeen, and St. Andrews.

The country now called Scotland emerges from pre-historic obscurity during the Roman occupation of Britain, though for many centuries little is known of its history. A Celtic (and Aryan) people seem to have entered the country, and to have gained predominance over the non-Aryans, the combined people occupying at the Roman invasion most of the country north of the Forth and Clyde estuaries, which was called Caledonia by the Romans, and its people Caledonians. The southern part of the country was inhabited by another Celtic race, the Brythons or Britons, of the same blood as the Welsh. The descendants of the Caledonians were afterwards called Picts, and were the predominant people in North Britain at the beginning of the 6th century, when a colony of Scots or Dalriads from Ireland effected a settlement in Argyle, and gradually spread over the adjacent regions. It is from these Scots (a Celtic and Gaelic-speaking people) that the country afterward received the name of Scotland, the original Scotland (Scotia) being Ireland. The Teutonic element was introduced into Scotland as early as the 4th century. About the middle of the 9th century Kenneth MacAlpin, son of a ruler of a body of Scots established in Galloway, but of Pictish descent through his mother, united in his own person the sovereignty of both the Picts and the Scots. The reigns of Kenneth and his immediate successors were one continued scene of warfare with the Norsemen on one hand and with the Britons of Strathclyde and the English of Northumbria on the other. On the advent of Malcolm Canmore (1058) to the throne after the death of Macbeth, the able usurper and murderer of Duncan (see Macbeth), the purely Celtic monarchy came to an end.

On the death of Malcolm the Celtic tribes placed his brother Donald Bane on the throne, but he was driven from it before he had reigned a year by Duncan, a natural son of the late king, who

now seized the scepter. In 1098, however, Edgar Atheling, obtained a force from the English king, and succeeded in gaining the kingdom for Edgar, the lawful son of Malcolm. Edgar was succeeded by his brother Alexander I., a prince whose reign is chiefly signalized by his severe administration of justice. He assisted Henry I. of England, who had married his sister, in a war with the Welsh, and died in 1124, leaving the throne to his younger brother David. David was brought into feudal relations with the Norman king of England. On the accession of the usurper Stephen to the English throne in 1135, to the prejudice of Maud or Matilda, wife of the Emperor Henry V., only child of Henry I. and niece of David, the latter made several expeditions into England in support of his niece's claim to the throne. His death in 1153 was preceded by that of his only son, so he was succeeded by his grandson, Malcolm the Maiden, whose reign of twelve years is only remarkable for his giving up Northumberland and Cumberland to the English king. On the death of Malcolm IV. in 1165 the crown fell to his younger brother William, who is known by the title of William the Lion. During an expedition into England for the purpose of regaining Northumberland he was taken prisoner (1175), and sent to Falaise in Normandy, where a treaty was concluded acknowledging the supremacy of England, and declaring Scotland a fief and himself a vassal of the English crown. This treaty remained in force till 1189, when Richard I. restored Scottish independence for the sum of 10,000 marks in order to equip a force to join the third crusade. The rest of William's reign was devoted to the consolidation of his kingdom in the north and west. The Scottish alliance with France, and many of the Scottish burgh charters, date from this reign. His successors were Alexander II., 1214-49, and Alexander III., 1249-1286. Margaret of Norway was only three years old at Alexander's death, and a regency consisting of four barons and two bishops was appointed. Margaret died in 1290 and was succeeded by John Baliol, who was crowned at Scone (1292) acknowledging Edward as his overlord. Edward had succeeded in conquering Scotland when Wallace, the man of the people, appeared. William Wallace, assisted by some of the barons and a considerable body of men, defeated the English governor, the Earl of Surrey, at Stirling Bridge (11th September, 1297), drove Edward's garrison out of the country, and made a raid into England. Edward, who was in Flanders, hastened home, and marching at the head of a large army, defeated Wallace at Falkirk (22d July, 1298), and before 1303 had repossessed himself of the whole country. In 1305 Wallace was betrayed into the hands of the English near Glasgow by Sir John Menteith; was carried to London, and after a mock trial was condemned as a rebel and traitor to Edward and executed (23d August, 1305). Wallace soon had a more fortunate, though not a more valiant, successor in Robert de Bruce. He had long been an

unwilling and restless retainer of Edward, but latterly determined to push his claims in Scotland, and was crowned as king of the country at Scone in 1306. At first his career was not successful, but the death of Edward I. at Burgh-on-Sands, on his way to Scotland, and the inactivity of his son Edward II., were turning-points in the recovery of the independence of Scotland. Gradually Bruce recovered the whole country, till in 1313 the only English garrison left was Stirling Castle, which was closely besieged by the Scotch. To relieve it Edward II. led into Scotland a great army, which was totally defeated by Bruce in the battle of Bannockburn (24th June, 1314). After this victory Bruce reigned with almost uninterrupted success, and died in 1329. On the death of Robert Bruce his son, David II., a boy six years old, was proclaimed king, and acknowledged by the great part of the nation. Edward Baliol, however, the son of John Baliol (who died 1314) formed a party for the purpose of supporting his pretensions to the crown; he was backed by Edward III. of England. At first Baliol was successful; and on the 24th September, 1332, he was crowned king at Scone, but eventually David succeeded in driving him from the kingdom. At his death in 1370, childless, the succession fell to Robert, son of Walter, the high steward, and of Marjory Bruce, daughter of Robert I. (Bruce), Robert II. being thus the first of the Steward, or as it came to be written, Stewart or Stuart, dynasty. Robert II. died in 1390 and was succeeded by his son, John, who upon his accession took the name of Robert III. The latter part of the reign of Robert III. was disturbed by the ambition of his brother, the Duke of Albany, who is said to have caused the death of the profligate young Duke of Rothesay, the heir to the throne. Afraid for the safety of his second son, James, Robert designed to send him to France; but the ship in which he was being conveyed was captured by the English, a misfortune which hastened the king's death (1406). James I. being then only eleven years of age, and a captive, the regency devolved on the Duke of Albany. After nineteen years of captivity he was crowned at Scone (1423). James' efforts to diminish the power of the great nobles provoked a conspiracy against him, and he was murdered in the Blackfriars' monastery at Perth (20th February, 1437). His son and successor James II. being only seven years of age, the country was subjected to the miseries of a long and feeble regency. One of the chief events of his reign was the rebellion and temporary overthrow of the powerful house of Douglas. James was accidentally killed by the bursting of a cannon at the siege of Roxburgh Castle (3d August, 1460). James III. was not quite eight years of age when he succeeded to the kingdom, which was again subject to all the troubles of a minority. In 1467 the young king married Margaret, daughter of the Norse king Christian, and in the shape of a pledge of payment of her dowry the Orkney and Shetland islands were given up to Scotland, of which they have ever since formed a

part. A confederation against him was formed by a number of his nobles in 1488; the forces met at Sauchieburn, near Stirling, where the royal army was defeated, and James was murdered in the flight. James IV., who had been induced to join the nobles hostile to his father, was sixteen years old when he ascended the throne. In 1503 he married Margaret, daughter of Henry VII. of England, and thus paved the way for the future union of the two kingdoms. The king was killed at Flodden Field (9th September, 1513); his infant successor James V. had not yet reached the age of two years. His cousin, the Duke of Albany, was appointed regent, but from an early part of the reign James was almost entirely in the hands of the Earl of Angus, who had married the queen dowager, and had almost complete control of affairs till 1528, when James then in his seventeenth year managed to escape to Stirling, take the government in his own hands, and drive Angus into England. His alliance was sought by England, France, and Spain, and in 1537 James married Madeleine, daughter of Francis I. The young queen died a few weeks after her arrival in Scotland, and in the following year James married Mary of Lorraine, daughter of the Duke of Guise. James died at Caerlaverock Castle (14th Dec., 1542), having just received tidings of the birth of his daughter, the future Mary Queen of Scots. The eventful period which followed the accession of Mary was dominated by the Reformation movement, and the questions affecting the Union of Scotland and England. In 1558 she was married to the dauphin who succeeded to the throne the following year, but died in 1560. Mary then returned to Scotland. Mary's reign was popular until her unfortunate marriage with Darnley in 1565. Darnley was murdered by the Earl of Bothwell and his servants, but whether Mary was accessory to the murder is yet a matter of controversy. The fact remains that she married Bothwell within three months, and alienated the greater number of her subjects. A confederacy was formed against her and she was imprisoned in Lochleven Castle. She escaped and fled to England and put herself under the protection of Elizabeth. Here she drops from Scottish history, but her after-life till her execution in 1587 was a continual series of plots to regain her lost throne. James VI., the son of Mary, being a mere child, Moray held the regency of the kingdom. The chief events of the reign, prior to the union of the crowns by the accession of James to the throne of England as James I., were the raid of Ruthven, the marriage of James to Ann of Denmark, and the Gowrie conspiracy. On the death of Elizabeth in 1603, James succeeded as the nearest heir through his descent from Margaret, daughter of Henry VII. and wife of James IV. He was crowned at Westminster, and assumed the title of King of Great Britain, France, and Ireland.

There were seven Scottish parliaments called by James after his accession, wherein he was represented by a commissioner sitting as president. His chief

energies were directed to an attempt to draw England and Scotland into a closer union by means of harmonizing the laws of the two countries, and by establishing episcopacy in Scotland. James VI. died in 1625, and was succeeded by his son, Charles I. Foreign wars and domestic troubles prevented Charles from visiting Scotland till 1633 when he was crowned at Edinburgh. At the outbreak of the civil war in England, Scotland took the part of the parliament against the king, and was of considerable assistance to the parliamentary forces at Marston Moor and elsewhere. The affairs of the king becoming hopeless in England, Charles gave himself up to the Scottish army posted before Newark 5th May, 1646, and was surrendered to the English parliament 30th January, 1647. After the execution of Charles (30th January, 1649) the Scots proclaimed his son king, under the title of Charles II. The young king was then in Holland. He arrived in Scotland, landing at the mouth of the Spey, 3d July, 1650, and marched southward by Aberdeen, Dundee, and St. Andrews to Falkland palace. Cromwell at Worcester utterly scattered the royalist forces, and compelled Charles to become a fugitive (3d September, 1651). Cromwell's death was soon followed by the fall of his son, Monk's march to London at the head of the army, and the restoration of Charles II. (1660). The Scottish parliament assembled under the Earl of Middleton, the king's commissioner, January 1, 1661, and it soon became apparent that Charles was determined to carry out the favorite scheme of his father and grandfather of establishing episcopacy in Scotland. Charles died in 1685, and was succeeded by his brother, James VII. of Scotland and II. of England. The chief events of his reign, so far as Scotland was concerned, were the rising, defeat, and execution of Argyle. At the Revolution a convention of the estates at Edinburgh proclaimed William, prince of Orange, James' son-in-law and nephew, and his wife Mary, James' daughter, king and queen of Scotland. Religious freedom was again restored, and in 1690 a general assembly of the Presbyterian church again met.

The death of William III. in 1702 transferred the crowns of the two nations to Queen Anne, sister of Mary. A joint commission was appointed to draw up articles of union in 1706. A majority of the parliament carried the measure (16th January, 1707); it received the royal assent (March 4); and the union took effect (May 1). The chief provisions of the Act of Union were (1) That the two kingdoms should be united under the name of "Great Britain;" (2) that the succession to the crown of the United Kingdom should be in the Electress Sophia of Hanover and her heirs, being Protestants; (3) that 16 Scottish peers and 45 Scottish members of the House of Commons should be elected to the one parliament sitting in London; (4) that the Established Presbyterian church of Scotland should be maintained; (5) that Scotland should keep unchanged her own laws and customs relating to property and private

rights, and also the court of session and other Scotch courts; (6) that all the rights of trade, free intercourse, and citizenship should be of the same for Scotch and English subjects. Henceforth the general history of Scotland may be said to be entirely identified with that of England.

SCOTT, Michael, author of *Tom Cringle's Log* and *The Cruise of the Midge*, was born at Glasgow, 1789, and died in 1835. The two brilliant sea-novels of which he was the author appeared anonymously in *Blackwood's Magazine*.

SCOTT, Sir Walter, Bart., poet and novelist, was born in Edinburgh, August 15, 1771. He was a younger son of Walter Scott, writer to the signet, by Anne, daughter of Dr. John Rutherford, professor of medicine in the University of Edinburgh, both connected with old Border families. In 1805 he became prominent as an original poet with the *Lay of the Last Minstrel*, an extended specimen of the ballad style, which fell upon the public as something entirely new, and at once became widely popular. In 1808 he published *Marmion*, another poetic romance which greatly increased his reputation; and in 1810 the *Lady of the Lake*, in which his poetical genius seems to have reached the acme of its powers. The appearance of *Waverley*, in 1814, forms an epoch in modern literature as well as in the life of Scott. This romance or novel was rapidly followed by numerous others, forming,



Sir Walter Scott.

from the name of the first, the series known as *The Waverley Novels*. The earlier of these were *Guy Mannering* (1815), *The Antiquary*, *The Black Dwarf*, *Old Mortality* (1816), *Rob Roy* (1817), *The Heart of Midlothian* (1818), *The Bride of Lammermoor*, *A Legend of Montrose*, and *Ivanhoe* (1819). These splendid works of fiction which surprised and enchanted the world, it is held by most, mark the high tide of his genius, those which follow being placed on a somewhat lower level, although there are several, especially in the second period, up to 1825, in which no falling-off is perceptible. *Ivanhoe* was followed by *The Monastery*, *The Abbot* (1820), *Kenilworth*, *The Pirate* (1821), *The Fortunes of Nigel*, *Peveril of the Peak* (1822), *Quentin Durward*, *St. Ronan's Well* (1823), *Redgauntlet* (1824), *The Betrothed* and *The Talis-*

man (1825), Woodstock (1826), The Chronicles of the Canongate, The Fair Maid of Perth (1829), Anne of Geierstein (1829), Count Robert of Paris and Castle Dangerous (1831). The Waverley novels were all published anonymously, nor did Scott cease to be the "Great Unknown" until 1827, although their authorship had long been an open secret to many. He died in 1832 and was interred in his family burial aisle amid the ruins of Dryburgh Abbey. His life was written by his son-in-law, John Gibson Lockhart, a work which has taken the position of a classic.

SCOTT, Winfield, commander-in-chief of the United States army, was the son of a Scottish Jacobite, and was born near Petersburg, Virginia, 1786; died at West Point, 1866. He was brought up to the law, and admitted to the bar, but never practiced. Entering the army he served with distinction in the war of 1812-14, and afterward visited Europe, and studied military science at Paris. In 1832 and the following years General Scott was employed in operations against the Indian tribes, and in 1841 he was appointed commander-in-



Winfield Scott.

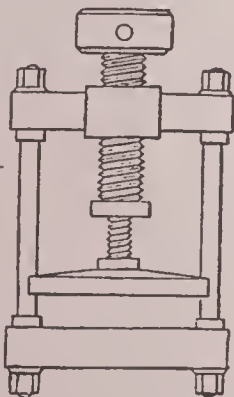
chief. His fame rests upon his brilliant conduct of the Mexican war of 1846-47, in which he gained several victories over Santa Anna, made himself master of Mexico, and concluded an advantageous peace. He was twice an unsuccessful candidate for the presidency. On the outbreak of the great civil war he remained true to the federal government, but was too infirm to take any actual command. He retired from active service in 1861, and in 1864 he published his autobiography.

SCOTUS, Duns. See Duns.

SCRANTON, the capital of Lackawanna co., Pennsylvania, in a valley near the Lackawanna river, 150 miles w.n.w. of New York. It owes its rapid prosperity to the numerous collieries in the vicinity, to its large rolling-mills and steel works, and extensive manufactures of railway rolling-stock, machinery edge-tools, leather, window sashes and blinds, silk fabrics, etc. The city was founded in 1840. Pop. 1909, 130,000.

SCREAMER, the name given to two genera of South American grallatorial or wading birds, the horned screamer and the closely allied crested screamer. The latter has no horn, but its head is furnished with a dependent crest of feathers.

SCREW, a wooden or metal cylinder having a spiral ridge (the thread) winding round it in a uniform manner, so that the successive turns are all exactly the same distance from each other, and a corresponding spiral groove is produced. The screw forms one of the six mechanical powers, and is simply a modification of the inclined plane. The energy is transmitted by means of a hollow cylinder (the female screw) of equal diameter with the solid one (the male screw), having a spiral channel cut on its inner surface so as to correspond exactly to the spiral ridge raised upon the solid cylinder. Hence the one will work within the other, and by turning the convex cylinder, while the other remains fixed, the former will pass through the latter, and will advance every revolution through a space equal to the distance between two contiguous turns of the thread. As the screw is a modification of the inclined plane it is not difficult to estimate the mechanical advantage obtained by it. If we suppose the power to be applied to the circumference of the screw, and to act in a direction at right angles to the radius of the cylinder and parallel to the base of the inclined plane by which the screw is supposed to be formed, then the power will be to the resistance as the distance between two contiguous threads to the circumference of the cylinder. But as in practice the screw is combined with the lever and the power applied to the extremity of the lever, the law becomes: The power is to the resistance as the distance between two contiguous threads to the circumference described by the power. Hence the mechanical effect of the screw is increased by lessening the distance between the threads or making them finer, or by lengthening the lever to which the power is applied. The law, however, is greatly modified by the friction, which is very great. The uses of the screw are various. It is an invaluable



Hunter's screw-press.

contrivance for fine adjustments such as are required in fine telescopes, microscopes, micrometers, etc. It is used for the application of great pressure as in the screw-jack and screw-press; as a borer in the gimlet; and in the ordinary screw-nail we have it employed for fastening separate pieces of material together. The differential screw or Hunter's screw, is formed of two screws, a larger and a smaller, the former being screwed internally to allow the latter to screw into it; the pitch of the

two screws differs slightly, and for each turn of the chief or larger screw the progress of the point of the compound screw is the difference of pitch. Greater power is in this way attained without the weakness due to a screw with fine threads. See also Screw-propeller, Archimedean Screw, Endless Screw.

SCREW-PINE, the type of an order of trees or bushes known as the Pandanaceae or Screw-pine order. They are natives of tropical regions, and abound in insular situations, such as the Eastern archipelago. They branch in a dichoto-



Screw-pine.

mous or forked manner, and are remarkable for the peculiar roots they send out from various parts of the stem. These roots are called aerial or adventitious, and serve to support the plant. The seeds are edible; and the flowers of some species are fragrant.

SCREW-PROPELLER, an apparatus which, being fitted to ships and driven by steam, propels them through the water, and which, in all its various forms, is a modification of the common screw. Originally the thread had the form of a broad spiral plate, making one convolution round the spindle or shaft, but now it consists of several distinct blades, forming portions of two, three, or four threads, as illustrated by a, b, c, Fig. 1, which give an idea of the various forms of blades for different sizes of propellers: a has a good shape for the larger sizes; b, having three blades, is successfully applied for twin screw steamers, and is also useful with two blades for medium sizes; c is suitable for small diameters and a moderate number of revolutions per minute. Either two or three blades of this shape answer well for barges and towing purposes. The usual position for the screw propeller is immediately before the stern-post, as shown in fig. 2, the shaft passing parallel to the keel into the engine-room, where it is set in rapid

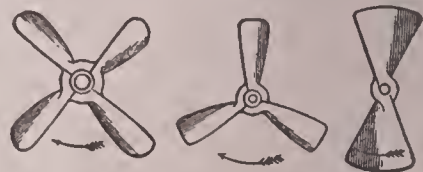


Fig. 1.—Forms of screw-propeller.

motion by the steam-engines. This rotary motion in the surrounding fluid,

which may be considered to be in a partially inert condition, produces, according to the well-known principle of the screw, an onward motion of the vessel more or less rapid, according to the velocity of the shaft, the obliquity of the blades, and the weight of the vessel. In 1827 Mr. Wilson of Dunbar produced

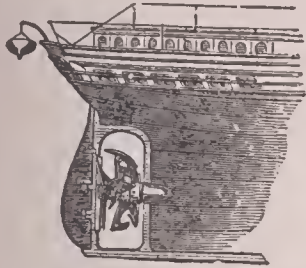


Fig. 2.—Screw-propeller in position.

a screw-propeller which proved satisfactory, but the successful introduction of the screw-propeller is due to Mr. F. P. Smith and to Ericsson, who both independently and about the same time (1838) secured patents. Numerous modifications of the screw-propeller have been proposed and adopted since it was first introduced, and it has now practically superseded the paddle-wheel for sea-going vessels.

SCRIBES, among the Jews, were officers of the law. There were civil and ecclesiastical scribes. The former were employed about any kind of civil writings or records. The latter studied, transcribed, and explained the Holy Scriptures.

SCROFULA, or **SCROPHULA**, a disease due to a deposit of tubercle in the glandular and bony tissues, and in reality a form of tuberculosis or consumption. It generally shows itself by hard tumors, of the glands in various parts of the body, but particularly in the neck, behind the ears, and under the chin, which, after a time, suppurate, and degenerate into ulcers, from which, instead of pus, a white curdled matter is discharged. The first appearance of the disease is most usually between the third and seventh year of the patient's age; but it may arise at any period between this and the age of puberty; after which it seldom makes its first attack. It is by no means a contagious disease, but is of a hereditary nature, and is often entailed by parents on their children. It may, however, remain dormant through life and not show itself till the next generation. The disease generally goes on for some years; and appearing at last to have exhausted itself, all the ulcers heal up, without being succeeded by any fresh swellings, but leaving behind them an ugly puckering of the skin, and a scar of considerable extent. This is the most mild form under which scrofula appears. In more virulent cases the eyes and eyelids are inflamed, the joints become affected, and caries of the bones supervenes. Hectic fever at last arises, under which the patient sinks; or the disease ends in tuberculated lungs and pulmonary consumption. Scrofula is also called struma and king's-evil.

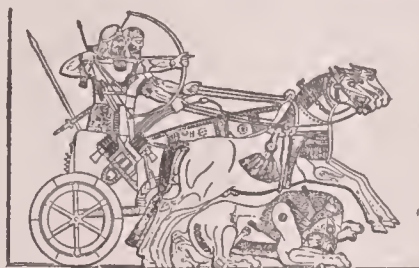
SCROLL, a very frequent ornament in architecture, consisting of a band arranged in undulations or convolutions.

The name is also given to the volute of the Ionic and Corinthian columns.

SCROPHULARIA'CEÆ, a very large natural order of herbaceous or shrubby monopetalous exogens, inhabiting all parts of the world except the coldest, containing about 160 genera and 1900 species. They have opposite or alternate entire toothed or cut leaves, and usually four or five lobed irregular flowers with didynamous stamens, placed in axillary or terminal racemes; with a two-celled ovary and albuminous seeds. Many of the genera, such as the foxglove, calceolaria, veronica, mimulus, antirrhinum, pentstemon, etc., are valued by gardeners for their beautiful flowers.

SCULPTURE, is the art of imitating living forms in solid substances. The word means strictly, a cutting or carving in some hard material, as stone, marble, ivory, or wood; but it is also used to express the moulding of soft substances, as clay or wax, and the casting of metals or plaster.

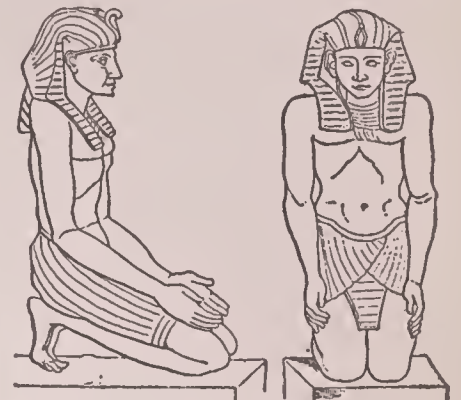
In producing a work of sculpture two processes are involved, "modelling"



Assyrian.—From Nimroud, 930-920 B. C.

and "casting," the former alone being truly the work of the artist. For ornament and figure the same method is employed. In the former a ground of clay is prepared, and upon it the lines of the ornament are lightly sketched, usually with a tool. These are then clothed upon firstly with important masses, then the connecting lines, and, lastly, the minor detail, the whole being afterward modelled to the forms desired. For a head or bust a flat board, set on a high stand, with a piece of wood standing at right angles to it, is used. Lead-piping is sometimes further em-

ployed to raise the height of this piece of wood, and around this structure the clay is roughly built up, a cylindrical mass for the neck, and an egg-shaped form for the head. Upon this latter the position of the features is marked, and the work carried on by reference to the



Egyptian.—From large figure in bronze.

character of the intended figure. Upon and around this framework the figure is first roughly built up with clay, care being taken to add just as much as is requisite, and to follow the general form and direction of the muscles. The essential difference between modeling and carving is that in the former the artist works from within outward by the additions of material, while in the latter from without inward by the taking away of material. The sculptor's work proper generally ends with the completion of the clay model. The next process is that of casting. Plaster of Paris of the consistency of thick cream is poured over the model to the depth of from 2 to 3 inches, the inner layer being colored. When this is set, the clay is carefully removed, and what is termed a "waste mould" is formed. This is carefully washed and when dry is then oiled. Into this mould plaster of Paris is poured, and when filled and set hard the waste mould is chipped off. The plaster of Paris has taken the place of the clay, and formed what is called a "cast." A head is



Grecian.—1, Faun of Praxiteles—Florence. 2, Niobe—Florence. 3, Amazon—the vatican.

usually cast in halves, and a similar treatment is adopted in the case of complete figures. This is termed "piece moulding." Parts which project very much are removed and cast separately, being afterwards attached by means of plaster of Paris. The reproduction of

usually cast in halves, and a similar treatment is adopted in the case of complete figures. This is termed "piece moulding." Parts which project very much are removed and cast separately, being afterwards attached by means of plaster of Paris. The reproduction of

this plaster cast in marble or stone is a mechanical operation, usually intrusted to a skilled workman. To aid him he employs a "pointing machine," by which he first finds out the distance of any point on the cast from an imaginary vertical plane placed in front, and into the block of marble drills a hole whose depth from the same plane equals this

this the mould is lined with wax and the core inserted close up to the wax lining. The wax is then melted out and the molten metal poured into the mould to take its place, the core being afterward removed. The earliest records of sculpture that we possess, exhibit the art in complete bondage to religion. Thus the sculptures of India and China are semi-

analogous to that obtained by the Greeks in their treatment of Hercules, but withal possessing no sense of ideal beauty.

These early products of art, valuable in themselves, are nevertheless chiefly interesting as leading the way to the full development of sculpture under the Greeks. Greek sculpture, in its infancy, is strongly stamped with oriental character, as may be seen by a careful examination of the reliefs from the temple of Assos now in the Louvre, and the metopes from Sellinus, casts of which are in the British Museum. But from the end of the 6th century B.C. the development of Greek art was rapid and continuous. Upheld on the one hand by a noble mythology, that magnified without distorting human attributes, and supported on the other by an increasing knowledge of nature, the ultimate perfection of Greek art became only a question of time. It came to perfection in Phidias, whose statues of Athene in the Parthenon at Athens (B.C. 438), and of Zeus in the temple at Olympia, mark the period of the highest style of Greek art. We have in the sculpture of this period, the highest type of human beauty joined to a god-like calm and reticence of emotion. Examples of the grand style of this epoch are the sculptures of the Parthenon; the colossal bronze head of Artemis in the British museum; the Venus of Milo, in the Louvre; and the exquisite relief representing the parting of Orpheus and Eurydice, in the museum at Naples. From the death of Alexander the Great, B.C. 323, onward to the conquest by the Romans, B.C. 146, the progress of Greek sculpture is only a further, and often a weaker, development of the same ideal. The celebrated group of the Laocoön, the head of the Dying Alexander, the Dying Gladiator, and the Apollo Belvedere, are some of the works of this epoch that are preserved to us.

The history of sculpture in Italy is only a continuance of its story in Greece. It was Greek art produced by Greek workmen that adorned the palaces of the emperors; and the Roman sculptors, in so far as they had any independent existence, can only claim to have impoverished the ideal they received from Greece. The special tendencies of Italian sculpture may be said to have reached their full expression in the work of Michael Angelo (1475-1564). Here we see all previous efforts to interpret passion and feeling summed up and concluded. His figures are charged with all the possibilities of human experience and emotion. It was toward this complete understanding of the resources of physical expression that all Italian art had been tending, and it is only more fully exhibited in Michael Angelo because he was the greatest master that Italy produced. His works are the statues in the chapel of the Medici at Florence, the Captives in the Louvre, the colossal David at Florence, the Moses in Rome, and the Madonna in Bruges. For a long period after Michael Angelo, Italian sculptors were content to imitate, and sometimes to exaggerate his manner. American sculpture is entirely due to Italian influence exer-



Renaissance—1, St. George, Donatello, Florence. 2, Moses, Michael Angelo. 3, Nymph, Goujon.

distance. Innumerable holes are thus drilled, and the solid marble cut away until the bottoms of all the holes are reached. This gives the form roughly, and the carver proceeds to copy from the plaster cast, carrying on the work under the supervision of the sculptor, who rarely carves the work himself except in

barbaric and naturalistic; and in the colossal figures of the rock-cut temples of India there is a superadded symbolism, which led to the most extravagant deformities of the human figure. It is to Egypt that we must turn for the first signs of higher and more vital art. The distinctive characteristics of Egyptian sculpture are colossal size, stability, and symmetry, the expression being that of calm repose and solemnity, with a suggestion of the supernatural. The best period of Egyptian sculpture was from 1450 to 1000 B.C. The best period of Assyrian sculpture as a style, is inferior to that of Egypt. Its characteristics are



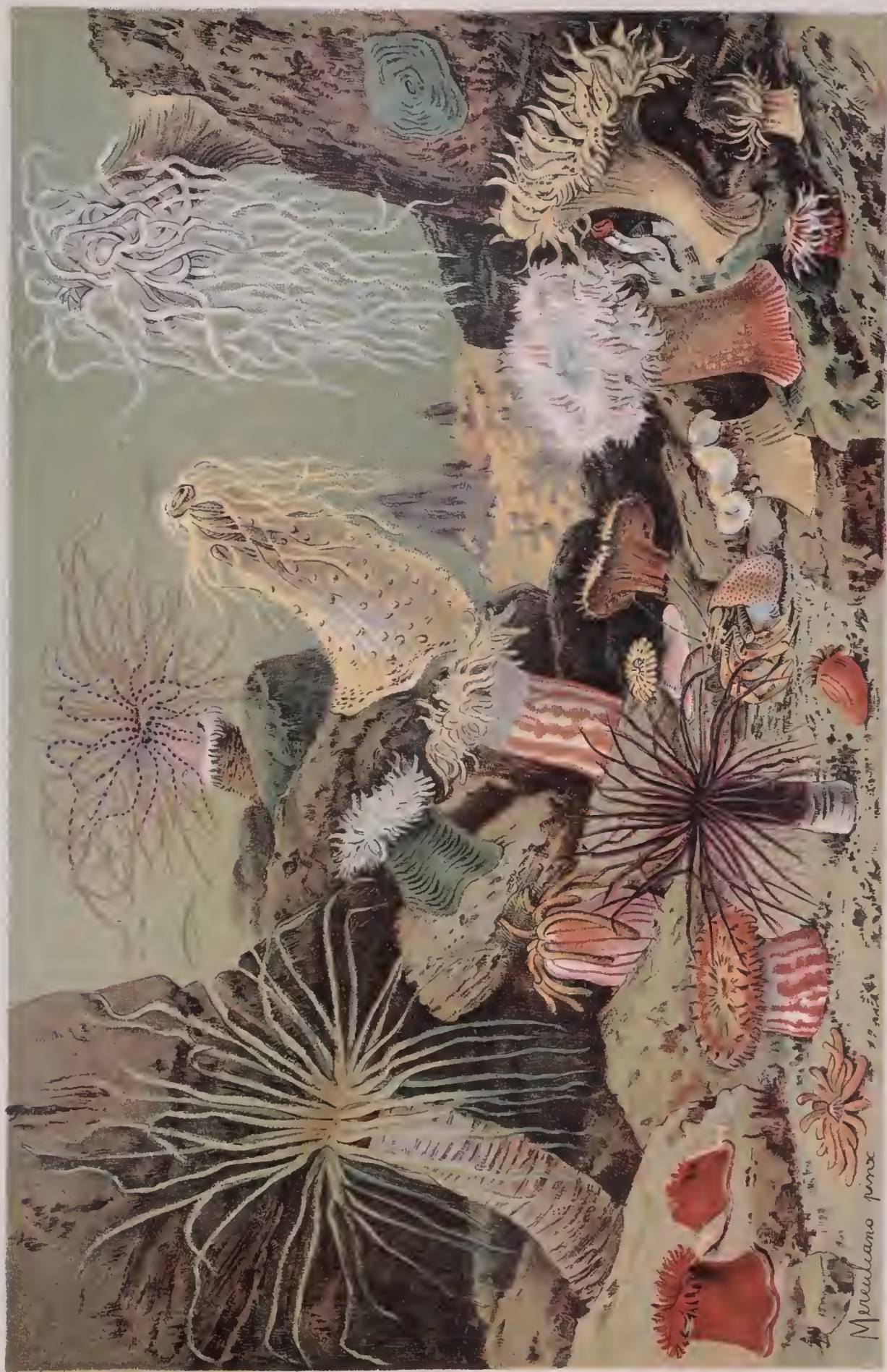
St. Michael and Satan.—Flaxman.



John Hampden.—Foley.

finishing touches. For casting in metal a plaster mould is first made as already described. Within this is fixed a rudely-formed, solid, but removable mass called a "core," the space between it and the surface of the mould being filled with the molten metal. Another method for smaller work is called "cire perdue." In

an intense and vigorous spirit of representation without the least reference to ideal beauty of any kind. Persian sculpture (560-331 B.C.) differs but little from Assyrian, and is usually included with it. Roughly hewn and badly modeled, the force of the animal forms yet gives it a sense of the gigantic,



SEA ANEMONES.

cised over Americans working in Italy. Among American sculptors are Crawford, Akers, Hiram Powers, W. W. Story, Wm. Henry Rinehart, Miss Hosmer, Gould, Ball, Couper, Saint Gaudens, MacMonnies, Partridge, Bartlet and Barnard.

SCULPTURED STONES, a name specially given to certain ancient monuments with sculptured ornaments or devices, sometimes with inscriptions, found in the British islands. Some of the inscriptions are in debased Latin. A good example of this class, called the Catt Stane, is found in the parish of Kirkliston, near Edinburgh. It is a monolith, composed of a large boulder of trap about 4½ feet in height, with an imperfect inscription, which marks it as a sepulchral stone. The peculiarity of these stones consists in certain symbols, supposed to be of religious character, but of which nothing certain is known, and no plausible interpretation has been given.

SCUPPERS, channels cut through the sides of a ship at the edges of the deck to carry water off the deck into the sea.

SCURVY, a disease of a putrid nature prevalent in cold and damp climates, and which chiefly affects sailors, and such as are deprived of fresh provisions and a due quantity of vegetable food. It seems to depend more on a defect of nourishment than on a vitiated state; and not to be of a contagious nature. It comes on gradually, with heaviness, weariness, and unwillingness to move about, together with dejection of spirits, considerable loss of strength, and debility. As it advances in its progress the countenance becomes sallow and bloated respiration is hurried on the least motion; the teeth become loose; the gums are spongy; the breath is very offensive; livid spots appear on different parts of the body; old wounds, which have long been healed up, break out afresh; severe wandering pains are felt, particularly by night; the skin is dry; the urine small in quantity; and the pulse is small, frequent, and toward the last intermitting; but the intellect, for the most part, clear and distinct. By an aggravation of the symptoms the sufferer in its last stage exhibits a most wretched appearance. Scurvy as usually met with on shore is unattended by any symptoms other than slight blotches, with scaly eruptions on different parts of the body, and a sponginess of the gums. In the cure, as well as the prevention of scurvy, more is to be done by regimen than by medicines, obviating as far as possible the several remote causes of the disease; but particularly providing the patient with a more wholesome diet, and a large proportion of fresh vegetables. Both as a preventive and as a curative agent lime or lemon juice is of the first importance in this disease.

SCUTARI, a town of Asiatic Turkey, on the Bosphorus, opposite Constantinople, of which it is a suburb. It is built on an amphitheater of hills, and contains numerous mosques, fine bazaars and baths, barracks, and a seraglio of the sultan. Behind the town is an immense cemetery. Scutari contains granaries and is a fruit market. The manufactures are saddlery, silk, muslin, and cotton stuffs. Pop. 60,000.

SCYLLA, a rock in the Strait of Messina, on the Italian side nearly opposite the whirlpool of Charybdis. Various legends were associated with Scylla and Charybdis, which were esteemed highly dangerous to navigators.

SCYM'NIDÆ, a family of sharks, distinguished by the absence of an anal fin, and by dorsals unfurnished with spines. The lobes of the caudal fin or tail are nearly equal, and the head is furnished with a pair of small spiracles. The Greenland shark is the best-known species.

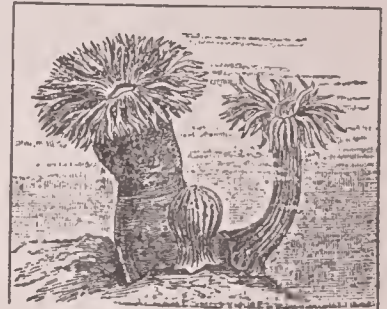
SCYTHE, an instrument used in mowing or reaping, consisting of a long curving blade with a sharp edge, made fast at a proper angle to the lower end of a more or less upright handle, which is bent into a convenient form for swinging the blade to advantage. Most scythes have two short projecting handles fixed to the principal handle, by which they are held. The real line of the handle is that which passes through both the hands, and ends at the head of the blade. This may be a straight line or a crooked one, generally the latter, and by moving the short handles up or down the main handle, each mower can place them so as best suits the natural size and position of his body. For laying cut corn evenly, a cradle, as it is called, may be used. The cradle is a contrivance somewhat resembling a rake with three or four long teeth so fixed to the scythe as to stretch the cut grain properly at each sweep of the scythe. A species of scythe which has been called the cradle-scythe is regularly used with the cradle for reaping in some localities. One form of scythe has a short branching handle somewhat in the shape of the letter Y having two small handles fixed at the extremities of the two branches at right angles to the plane in which they lie. The Hainault scythe is a scythe used with only one hand, and is employed when the corn is much laid and entangled. The person has a hook in one hand with which he collects a small bundle of the straggling corn, and with the scythe in the other hand cuts it.

SCYTH'ANS, a name very vaguely used by ancient writers. It was sometimes applied to all the nomadic tribes which wandered over the regions to the north of the Black and the Caspian seas, and to the east of the latter. In the time of the Roman empire the name Scythia extended over Asia from the Volga to the frontiers of India. The people of this region, being little known, were the subject of numerous fables.

SEA. See Ocean.

SEA-ANEMONE, the popular name given to a number of animals including the genus *Actinia* and other genera. They are among the most interesting organisms met with on the sea-beach, and in aquaria from a great attraction. All sea-anemones, however varied in coloration or form, present the essential structure and appearance of a fleshy cylinder, attached by its base to a rock or stone, and presenting at its free extremity the mouth, surrounded by a circlet of arms or tentacles. With these tentacles, which may be very numerous, in some cases exceeding 200 in number, they seize and secure their food—small

crustacea, molluscs, such as whelks, etc.—which they paralyze by means of the thread-cells common to them with all Cœlenterata. The mouth leads into a stomach-sac, which, however, is imperfectly specialized, and is such that a generalized idea of the structure of a sea-anemone may be gained by supposing that the animal in transverse section represents a double tube, the outer tube corresponding to the body-walls, and the inner tube to the stomach-sac. When fully expanded the appearance of the anemones in all their varieties of color is exceedingly beautiful. But upon the slightest touch the tentacles can be quickly retracted within the mouth-aperture, the fluids of the body are expelled by the mouth, and the animal, from presenting the appearance of a fully expanded flower, becomes a con-



Sea-anemones.

cal mass of jelly-like matter. Although these forms are attached to rocks and fixed objects, they appear able to detach themselves at will. They are, most of them, dioecious, that is, having the sexes situated in different individuals. The young are developed within the parent body, and appear in their embryo-state as free swimming ciliated bodies of an oval shape. The sea-anemones resemble the *Hydræ* in their marvelous powers of resisting injuries and mutilation. Thus if a sea-anemone be divided longitudinally, a new animal will in due time be formed out of each half. They appear singularly insusceptible also to the action of hot or cold water, and seem to be wonderfully long-lived. They are eaten as food in Italy, Greece, Provence, and on various other coasts.

SEA-BATHING produces the stimulating effects of the ordinary cold bath with the additional stimulus due to the salt, so that it acts as an invigorating tonic. Persons who are anæmic—that is of deficient quality of blood—and those suffering from any internal complaint ought to refrain from sea-bathing. It has, however, been found very salutary in several complaints, as diseases of the glands of all kinds, and of the skin in scrofula and a scrofulous predisposition, exhausting sweats, and tendency to catarrhs, chronic nervous diseases, particularly hysteric attacks, epilepsy, St. Vitus' dance; also sometimes in chronic rheumatism.

SEA-COW. See Manatee.

SEA-DACE. See Bass.

SEA-DEVIL. See Engler.

SEA-DRAGON, a teleostean fish included among the Lophobranchii. The breast is very wide, and the large size

SEA-EAGLE

of the pectoral fins, which form wing-like structures, together with its general appearance, have procured for this fish its popular name. The sea-dragon occurs in Javanese waters. The dragonets, fishes of the goby family, are also known as sea-dragons.

SEA-EAGLE, a name applied to one or two members of the eagle family; but probably with most distinctive value to the cinereous or white-tailed eagle or erne found in all parts of Europe. It is generally found inhabiting the sea-coasts, and although living mainly upon fish, yet makes inland journeys in search of food, and seizes lambs, hares, and other animals. The head is covered with long drooping feathers of ashy brown color, while the body is of a dark-brown hue, streaked in some places with lighter tints, and having the primary feathers of the wing mostly black. The tail is rounded, and is of white color in the adult, but brown in the young bird. The bird breeds in Shetland and in the Hebrides. Its average size appears to be about 3 feet in length, and from 6 to 7 feet in expanse of wings. The American baldheaded eagle from its frequenting the sea-coasts is also named the sea-eagle. See Eagle.

SEA-HARE, the name of a genus of gasteropodous mollusca. These animals are slug-like in appearance, and derive their popular name from the prominent character of the front pair of tentacles, which somewhat resemble the ears of a hare. The shell is either absent or is of very rudimentary character, and is concealed by the mantle. Four tentacles exist, and the eyes are situated at the



Depilatory sea-hare.

base of the hinder tentacles. The sea-hares are widely distributed throughout most seas, and generally inhabit muddy or sandy tracts. They emit a fluid of a rich purple hue, which, like the ink of the cuttle-fishes, has the property of diffusing itself quickly throughout the surrounding water. They are also known to discharge an acrid fluid of milky appearance, which has an irritant effect on the human skin.

SEA-HOG. See Porpoise.

SEA-HORSE. See Hippocampus.

SEAL, an engraved stamp bearing a device or inscription pertaining to the owner; also the impression of such a stamp on a plastic substance as wax. A seal upon a document was originally a substitute for a signature; a seal upon a place of deposit answered the purpose of security in a different manner from a lock. The use of seals is of the highest antiquity, and one of the earliest and commonest forms is the signet-ring. In Egypt impressions of seals were made in fine clay, and attached to documents by slips of papyri. The Romans used clay, bees'-wax, and in the time of the empire lead for taking impressions. In the

time of Constantine flat metal seals called bullæ were used. The metals used were gold, silver, and lead, and the bullæ were attached to documents by silk or woolen bands. The leaden seal was adopted by the popes. The western monarchs generally used bullæ up to the 16th century. The use of bees'-wax was introduced by the Normans; sealing-wax was invented in the 17th century.

SEAL, the name applied collectively to certain genera of mammals.

The true or hair seals, have a body of fish-like contour. They have no external ear, and the hind limbs are permanently stretched out behind the body and parallel with the tail, a conformation obviously inappropriate and unsuited for supporting the body for locomotion on land, but admirably adapted for swimming. Five toes exist on each foot and the middle digits of the hinder feet are much shorter than the outer ones. The toes, which are provided with claw-like nails, are united by a web of skin, and so form effective swimming paddles.



Marbled seal.

The fore limbs are mere flippers. The dentition resembles that of carnivora generally. The fur generally consists of a dense thick under-fur and of an outer coat of longer and coarser hairs. The bones are of light spongy texture, and beneath the skin is a thick layer of blubber or fat. The eyes are large and intelligent, and the sense of smell is also well developed. The sense of touch appears to reside chiefly in the "whiskers" of the face. The brain is of large size in proportion to the body, and when domesticated seals exhibit a very high degree of intelligence. They are polygamous, and seldom produce more than two young at a birth, one being the common number. They occur almost in all seas except those of tropical regions. In the northern regions they are more especially plentiful. They are largely hunted for their skins, which are converted into leather, and for their blubber, from which a valuable oil is obtained. The



Hooded or crested seal.

common seal is found widely throughout the northern regions, and also around the more northern coasts of Britain. Its average length is from 3 to 5 feet,

SEAL

and the fur is a grayish-brown, mottled with black. It is very destructive to most of the food fishes. It is much attached to its young, and is strongly attracted by musical sounds. It is never met with in large numbers, or far away from the land. Closely allied to the common seal is the marbled seal met with on some of the European coasts. The harp seal, Greenland seal, saddle-



Sea-leopard.

back, or atak, inhabits almost all parts of the Arctic ocean. The males average 5 feet in length, are colored of a tawny gray, and on the back there is a dark mark resembling a harp or saddle in shape. In the spring, at breeding season, these seals resort in immense herds to the floes of the Arctic ocean, around Jan Mayen island, where great numbers of them are killed annually by crews of the sealing vessels. The great seal, which measures 8 or 10 feet in length, occurs in Southern Greenland. The gray seal attains a length of from 8 to 9 feet and is found on the Scandinavian and Icelandic coasts. The best known fur seal is the northern fur-seal which breeds



Sea-lion.

in the islands of the Pribyloff group, off the coast of Alaska, and at the Commander islands in the Behring sea. The outer and longer hairs of its fur are of a grayish-brown color, the thicker under-fur being darker or reddish-brown; and it is this fine under-fur which, when stripped of the coarse outer hairs and dressed by the furrier, affords one of the most beautiful and valued of the "seal-skins" of commerce.

The fur-seal fishery is carried on chiefly at the Pribyloff islands, the United States government having leased them to a company with the right of killing 100,000 young males per annum. The states claimed the right to entirely prohibit sealing in Behring sea, a claim which led to difficulties with Britain, and the case was decided against them by arbitration, except as regards the

three-mile limit. However, by mutual arrangement, a close time is now in force for the seals within a certain area, and killing is entirely prohibited within certain limits.

SEALING-WAX, a resinous preparation used for securing folded papers and envelopes, and for receiving impressions of seals set to instruments. Ordinary sealing-wax is made of pure bleached ac, to which when melted are added Venice turpentine and vermilion. Inferior qualities consist of a proportion of common rosin and red-lead, and black and other colors are produced by substituting appropriate pigments. Sealing wax was invented in the 17th century.

SEA-LION. See Seal.

SEARCH-WARRANT, in law, a written authority granted by a magistrate to a legal officer to search a house or other place for property alleged to have been stolen and suspected to be secreted in the place specified in the warrant. Similar warrants are granted to search for property or articles in respect of which other offenses are committed, such as base coin, coiners' tools, explosives, liquors, etc., kept contrary to law.

SEA-SERPENT, a marine serpentine form of large size or sea-monster of doubtful character, frequently alleged to have been seen. From the numerous substantiated accounts of animals of the kind or another, but differing from the described and known forms having been seen, often close at hand, by the crews and passengers of ships, and by respectable observers on land, we are left up to the choice either of believing that in every case the senses of the observers must have been mistaken, or that the living form must have been seen in the majority of cases. Careful research, and the weighing of the evidence presented in the accounts of "sea-serpent" phenomena, show that the subject demands, at least, investigation.

SEA-SICKNESS, the name given to the nausea and other disagreeable sensations produced on those unaccustomed to sea-faring life by the rolling motion of a vessel at sea. The exact causes and etiology of this complaint are as yet imperfectly understood. Some observers have referred the malady to causes entirely dependent upon the altered or affected functions of the nervous centers, others to the regurgitation of the bile from the stomach; and others, again, to the irritation of the liver consequent on the unusual movements of the body. Probably all three views contain a certain amount of truth. The measures which have been suggested for seasickness are preventive or curative. Preventive measures, so far as the construction of the vessels themselves are concerned have not proved of much practical utility. Preventive measures, regarded from the patient's point of view, are practically limited to the regulation of the diet, which for some time previously to undertaking the voyage should be plentiful, but of light and nutritious character. The bowels should not be constipated above all things; and food should not be taken for at least five or six hours before going aboard. A cup of strong coffee,

swallowed just before embarking, proves beneficial to some as a nerve stimulant; while others derive benefit from a nerve sedative, such as bromide of potassium, chloral, or opium; but these, especially the two last, should never be used save under strict medical direction. Nitrate of amyl and cocaine have also been used. Once on board the ship, a position as near the center of the vessel as practicable is to be preferred, and the posture in lying should be that on the back, with the head and shoulders very slightly elevated. With reference to curative measures, during the attack of nausea and vomiting, some derive benefit from a bandage applied moderately tight across the pit of the stomach; some from small doses of brandy and ice; some from saline effervescing drinks; and some from frequent draughts of lukewarm or even cold water.

SEA-SNAKE, a name common to a family of snakes. These animals frequent the seas of warm latitudes. They are found off the coast of Africa, and are plentiful in the Indian archipelago.



Sea-snake.

They are all, so far as known, exceedingly venomous. They delight in calms, where the ripple collects numerous fish and medusæ, on which they feed. One species inhabits the Australian seas, and is as thick as a man's thigh.

SEASONS, the four grand divisions of the year—spring, summer, autumn, winter. These have distinctive characters, best seen in the temperate zones. Within the tropics they are not so much marked by differences of temperature as by wetness and dryness, and are usually distinguished as the wet and dry seasons. Astronomically speaking, spring is from the vernal equinox, when the sun enters Aries, to the summer solstice; summer is from the summer solstice to the autumnal equinox; autumn is from the autumnal equinox to the winter solstice; winter is from the winter solstice to the vernal equinox. The characters of the seasons are reversed to inhabitants of the southern hemisphere. See Spring, Summer, Autumn, Winter; also Climate, Earth, Equinox, etc.

SEA-SPIDER, or **SPIDER-CRAB**, a marine crab. Its body is somewhat triangular in shape, and its legs are slender and generally long. It lives in deep water, and is seldom seen on the shore.

SEA-SURGEON, or **SURGEON-FISH**, so named from the presence of a sharp spine on the side and near the extremity of the tail, bearing a resemblance to a surgeon's lancet. It occurs on the Atlantic coasts of South America and Africa, and in the Caribbean seas. Its average length is from 12 to 19 inches.

SEA-SWALLOW, a name given to the common tern and also to the stormy petrel. Which see.

SEA-TOAD, a name given to the great spider-crab found on British coasts at low-water mark.

SEATTLE (sē-at'l), capital of King co., state of Washington, on Seattle bay, east side of Puget sound, the largest city in the state and the seat of the state university. It is a rapidly growing place, with numerous industrial establishments, such as shipyards, foundries, machine-shops, saw-mills, breweries, and an active trade in coal and lumber. Pop. in 1909, estimated at 300,000.

SEA-URCHIN. See Echinus.

SEA-WATER, the salt-water of the sea, or ocean. Sea-water contains chlorides and sulphates of sodium (chloride of sodium = common salt), magnesium, and potassium, together with bromides and carbonates, chiefly of potassium and calcium.

SEA-WEED, any plant growing in the sea; but the name is usually confined to members of the natural order Algæ.

SEBACEOUS GLANDS, small structures of glandular nature and sacculated form which exist in the substance of the corium, or deeper layer of the dermis or true skin, and secrete a fatty matter. They are very generally distributed over the entire skin surface, but are most numerous in the face and scalp. Those of the nose are of large size, but the largest in the body are those of the eyelids—the so-called Meibomian glands. They appear to be absent from the skin of the palms of the hands and soles of the feet. Each sebaceous gland consists essentially of a lobulated or sac-like structure, with cells which secrete the sebaceous or glutinous humors, and with a single efferent duct; and these ducts open into the hair-follicles, or sac-like involutions of the skin which surround and inclose the roots of hair, or simply on the external surface of the skin. The functions of the sebaceous secretion are chiefly those of keeping the skin moist.

SEBASTIAN, St., Christian martyr, was born at Narbonne, and under Diocletian was captain of the prætorian guard at Rome. He rose to high favor at court, but declared himself a Christian, and refusing to abjure, he was tied to a tree and pierced with arrows. A Christian woman named Irene, who came by night to inter his body, finding signs of life in him, took him home, and nursed him till he recovered. He then presented himself before Diocletian, and remonstrated with him on his cruelty; whereupon the emperor ordered him to be beaten to death with rods (January 20, 288), and his body to be thrown into the cloaca. His protection was invoked against pestilence, and his martyrdom has been a favorite subject with painters.

SEBAS'TOPOL, a Russian town and naval station on the Black sea, in the southwest of the Crimea. On the outbreak of the Crimean war, when the population amounted to 43,000 it became the point against which the operations of all the allies were mainly directed and its siege forms one of the most remarkable episodes in modern history. Railway communication with Moscow has greatly improved the trade. There are many important public buildings, and the monuments and relics of the

siege are interesting. Pop. 50,710, largely military.



SECESSIONIST, one who maintains the right of a state included under the constitution of the United States to withdraw from the Union and set up an independent government; specifically one who took part or sympathized with the inhabitants of the southern states in their struggle, commencing in 1861, to break away from union with the northern states.

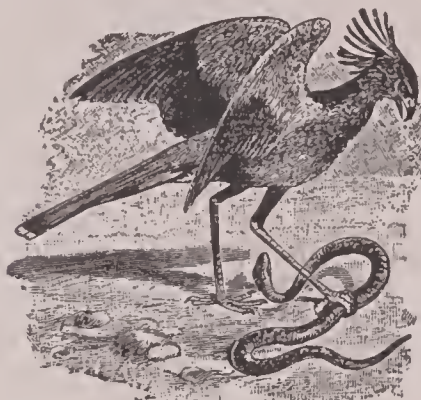
SECOND, in the measurement of time and of angles, the 60th part of a minute; that is, the second division next to the hour or degree.

SECONDARY FORMATIONS, in geology, the Mesozoic strata, midway, in ascending order, between the Primary or Palæozoic below and the Tertiary or Kainozoic above. They range from the top of the Permian Formation to the base of the Eocene, and include, therefore, the Trias, Lias, Oolitic, and Cretaceous Formations.

SECOND SIGHT, a Highland superstition, formerly very common, which supposed certain persons endowed with the power of seeing future or distant events as if actually present. These visions were believed to be not as a rule voluntary, but were said to be rather dreaded than otherwise by those who were subject to them; yet it was also believed that those who possessed this gift might sometimes induce visions by the performance of certain awful rites. The subject is treated at length in Martin's Description of the Western Islands of Scotland (1703); Macleod of Hamir's Treatise on the Second Sight (1763), and is discussed also in Dr. Johnson's Journey to the Hebrides (1775).

SECRETARY BIRD, the sole representative of the genus *Serpentarius* order Accipitres or birds of prey. It derives its popular name from the peculiar plumes of feathers which project from the back and sides of its head, and give it the appearance of having bundles of pens stuck behind each ear. It has very long legs, and stands nearly 4 feet in height. The wings are elongated, and carry a blunt spur on the shoulder, the third, fourth, and fifth quills being the longest. The tail is also very long, and wedge-shaped, the two middle feathers projecting beyond the others. The tibiae are feathered all the way down. The skin around the eyes is destitute of feathers. The general color is a slaty gray, the pen-like feathers of the head

being black, as also are the feathers of the tibiae and the primaries of the wings. The secretary bird can fly with ease when once it takes wing, but it seems to prefer the ground. It is found over the greater part of Africa, especially in the south. It derives its generic name from its habits of destroying serpents, strik-



Secretary-bird.

ing them with its knobbed wings and kicking forward at them with its feet until they are stunned, and then swallowing them. As a foe to venomous snakes it is encouraged and protected in South Africa, where it is frequently brought up tame.

SECRETARY OF STATE. See State, Department of.

SECRETION, in animal physiology, is the separation of certain elements of the blood, and their elaboration to form special fluids, differing from the blood itself or from any of its constituents, as bile, saliva, mucus, urine, etc. Secretion is performed by organs of various form and structure, but the most general are those called glands. Of these glands the essentially active parts are the cells, which elaborate from the blood a peculiar fluid in each instance predetermined by the inherent function of the gland or organ of which the cells are integral parts. The chief general conditions which variously affect secretion are the quantity and quality of the blood traversing the gland and the influence of the nervous system. Mental conditions alone, without material stimuli, will excite or suppress secretion; but this is a branch of the subject which is yet ill-understood. Animal secretions have been arranged into—(1) Exhalations, which are either external, as those from the skin and mucous membrane, or internal, as those from the surfaces of the closed cavities of the body and from the lungs; (2) Follicular secretions, which are divided into mucous and cutaneous; and (3) Glandular secretions, such as milk, bile, urine, saliva, tears, etc.

Secretion, in vegetable physiology, is the separation of certain elements from the sap, and their elaboration by particular organs. These secretions are exceedingly numerous, and constitute the great bulk of the solid parts of plants. They have been divided into (1) General or nutritious secretions, the component parts of which are gum, sugar, starch, lignin, albumen, and gluten; and (2) Special or non-assimilable secretions, which may be arranged under the heads of acids, alkalies, neutral principles,

resinous principles, coloring matters, milks, oils, etc.

SECULARISM, a philosophy of life the gist of which consists in the advocacy of free thought and the assertion of some corollaries derived from this leading tenet. It is not atheistic, inasmuch as it is no tenet of that system either to affirm or deny the existence of God; nor does it deny the truth of Christianity, for that is none of its business any more than it is to affirm or deny some scientific theory. Secularism in England is an offshoot of the socialism of Robert Owen, but its immediate founder is George Jacob Holyoake, native of Birmingham, where he was born in 1817, and began to promulgate his views about 1846. It is to him that British legislation is chiefly indebted for the Evidence Amendment Act, which legalized affirmations in lieu of oaths. Mr. Charles Bradlaugh, Mr. Holyoake's successor in the leadership of the English secularists, carried this question a step further by his refusal to take the parliamentary oath and by the act of 1888 allowing affirmation instead.

SECUNDERABAD, or **SIKANDARABAD** (Alexander's Town), British military cantonment in India, in the Nizam's Dominion, 6 miles northeast of Hyderabad. It is the largest military station in India, covering a total area of 19 sq. miles, including many interspersed villages, and forms the headquarters of the Hyderabad subsidiary force, which constitutes a division of the Indian army. Pop. 74,000.

SEDA'LIA, the capital of Pettis county, Missouri, 189 miles west of St. Louis, a railroad center and the seat of two machine shops and carriage factory of two railroad companies. Pop. 17,100.

SEDAN, Sedan chair, a covered chair for carrying one person, borne on poles



Sedan chair, time of George II. (Shut).



Sedan. (Open).

by two men, and differing from the palanquin in that the traveler is carried in a sitting posture. It is said to

have taken its name from the town of Sedan in France. It was introduced into England in 1581, and was very fashionable during the reigns of Anne and the early Georges, but disappeared at the beginning of the 19th century, on the introduction of the cab.

SEDATIVES, medicines that moderate the excessive action of an organ or organic system. Digitalis, for example, is a sedative of the action of the heart and the circulatory system; and gummescins are sedatives that act on the nervous system. Besides these aconite, chloroform, conium, carbonic acid, and lactic acid are among the principal sedatives.

SEDGE, an extensive genus of grass-like plants, containing thousands of species, mostly inhabiting the northern and temperate parts of the globe. The greater proportion of the species are marsh plants. The stems are usually triangular, without joints. The sedges in general are but of little utility to man. They furnish coarse fodder, which is selected by most of the domestic quadrupeds. The decomposed roots and leaves contribute largely to turn the soil of marshes into peat.

SEDGE-WARBLER, a species of insectivorous bird of the warbler family,



Sedge-warbler.

which frequents the sedgy banks of rivers, visiting Britain about the middle of April and migrating in September.

SEDGWICK, John, American soldier, was born in Cornwall, Conn., in 1813; died near Spottsylvania Courthouse, Virginia, May 9, 1864. He took part in the Mexican war, and at the beginning of the civil war was lieutenant-colonel of the second cavalry. In August, 1861, Sedgwick was commissioned brigadier-general of volunteers, and assigned to the army of the Potomac. At Antietam Sedgwick was wounded, but would not allow himself to be taken from the field. While directing the gunners in placing the pieces of artillery in position in front of Spottsylvania Courthouse, he was shot in the head and instantly expired.

SEDITION, a term including all offenses against the crown and government which do not amount to treason, and are not capital, as seditious libels, seditious meetings, seditious conspiracies. The offenses classed under the head of sedition are of the same general character with those called treason, but without the overt acts which are essential to the latter.

SEDUCTION, in law, the act of per-

suading a female, by flattery or deception, to surrender her chastity. English law does not give a right of action either to the woman seduced or to her parents or guardians; it only gives a right of action for seduction as occasioning loss of service; but the word "service" is interpreted with the greatest liberality, and damages are estimated not only with reference to the loss of service, but also to the distress and dishonor brought upon the woman's family by her seducer. By the law of Scotland an action for seduction is competent to a husband against the seducer of his wife, and to an unmarried woman against her own seducer, but she must show that deceit was used toward her. In neither country is seduction a criminal offense. The statutory rule which prevails widely in the United States rests both the right and remedy where the wrong is inflicted, in the family and parental relations. The action is therefore brought in the case of an unmarried woman by the parent (or guardian) as the head of the family, and in the case of a married woman by the husband.

SEE, a word derived (through the French) from the Latin sedes, a seat, and properly applied to the seat or throne of a bishop, but more generally employed as the designation of the city in which a bishop has his residence, and frequently as that of the jurisdiction of a bishop, that is, as the equivalent of diocese.

SEED, the impregnated ovule of a plant. It consists essentially of two parts, namely, the nucleus or kernel, and the integuments. The latter consists of two seed-coats—the outer named the epispem or testa, the inner the tegmen or endopleura; and the two together are sometimes termed the spermoderm. The testa of some seeds is furnished with hair, which cover the entire surface, as in various species of Gossypium, where they constitute the material called cotton; or they may be confined to certain points of the surface, as in the willow, Epilobium, etc.; while in the pine the testa forms a wing. On the



Various forms of seeds magnified.

1, Eschscholtzia californica. 2, Corn blue-bottle. 3, Oxalis rosea. 4, Opium poppy. 5, Stellaria media. 6, Sweet-william. 7, Fox-glove. 8, Saponaria calabrica.

outside of the integument of the seed there is sometimes an additional partial covering, which has received the name of aril, and in the nutmeg forms the mace. The nucleus or kernel of the seed is the fully developed central portion of the ovule. It consists either of the embryo alone, as in the wallflower, or of the embryo along with a separate deposit of nourishing matter called albumen, as in the cocoanut and wheat. The embryo is

the young plant contained in the seed, and is the part to the development of which all the reproductive organs contribute. It consists of a general axis, one part of which is destined to form the root, the other to form the stem. The axial portion is provided with fleshy organs called cotyledons or seed leaves, which serve to nurse the young plant before the appearance of the true leaves. Plants possessing one cotyledon are termed monocotyledonous, those having two are denominated dicotyledonous and plants having only a cellular embryo, as in the cryptogamic or flowerless plants, are called acotyledonous. When seeds are contained in an ovary, as is usually the case, the plants are called angiospermous; when the seeds are not contained in a true ovary, with a style or stigma, the plants are called gymnospermous, as conifers.

SE-GAN FOO, the capital of the province of Shen-se, in the northwest of China. It was long the capital of the empire, and is still of great importance; silk, tea, and sugar being the principal articles of commerce. Pop. estimated at about 1,000,000.

SEGO'VIA, a town in Spain, capital of the province of the same name, on a lofty rock, washed by the Eresma and Clamores, 43 miles northwest of Madrid. —The province, area 2713 sq. miles, is watered by streams which rise in the Guadarrama range and flow northward to the Douro. The inhabitants are for the most part employed in agricultural and pastoral pursuits. Pop. 160,111.

SEIDLITZ POWDERS, an aperient medicine, named after the Seidlitz spa in Bohemia. These powders are usually put up in a blue and a white paper, the blue containing tartrate of soda and potash (Rochelle salt) with bicarbonate of soda, and the white tartaric acid. The former is dissolved in half a tumbler of water, and the acid powder is then added, which produces effervescence, and the draught is taken while the effervescence is going on.

SEINE (sen or sän), a river in France, which rises on the Plateau de Langres, dep. of Côte-d'Or, 20 miles northwest of Dijon. It flows generally in a northwest direction; receives on the right the Aube, Marne, and Oise, and on the left the Yonne and Eure; passes the towns of Chatillon, Troyes, Corbeil, Paris, St. Denis, St. Germain, Poissy, Mantes, Elbœuf, Rouen, Quillebœuf, and, after a somewhat tortuous course, falls into the English channel between Honfleur and Havre. Its total length is 480 miles, and 250 miles in a direct line; and its basin has an area of about 30,000 sq. miles.

SEINE, a department in France, completely inclosed by the department of Seine-et-Oise, and at once the smallest and most populous of the French departments, including as it does the city of Paris. Area, 185 sq. miles; pop. 3,669,930. The department has 3 arrondissements (Paris, St. Denis, and Sceaux), 28 cantons (20 in Paris), and forms the archiepiscopal diocese of Paris.

SEINE Sean (sän), a large net for catching fish, buoyed up and weighted so as to float perpendicularly, the fish being enclosed and caught by bringing

the ends of the net together by means of ropes.

SEINE-ET-MARNE (sen-e-márn), a French department in the basin of the Seine and Marne, east of Seine-et-Oise. Area, 2215 sq. miles; pop. 355,136. The capital is Melun.

SEINE-ET-OISE (sen-e-wäz), a French department, in the basin of the Seine and Oise, inclosing the department of Seine. Area, 2163 sq. miles; pop. 707,325. The capital is Versailles.

SEINE-INFERIEURE (sen-an-fä-ri-eur), a maritime department of France, on the English channel, mostly n. of the estuary of the Seine. Area, 2330 sq. miles; pop. 833,386. The capital is Rouen.

SEISMOLOGY (sis-mol'o-ji), the science which treats of volcanoes and earthquakes.

SEISMOMETER, an instrument for measuring the force and direction of earthquakes and other earth movements. It records both the horizontal and vertical movements by means of an index, the record being traced on smoked glass. There are various forms of seismometer or seismograph. One which is used in the observatory on Mount Vesuvius consists of a delicate electric apparatus, which is set to work by the agitation or change of level of a mercurial column, which records the time of the first shock, the interval between the shocks, and the duration of each; their nature, whether vertical or horizontal, the maximum intensity; and in the case of horizontal shocks the direction is also given.

SEJANUS, Aelius, the son of a Roman knight, and noted as the favorite of Tiberius, was born as Vulsinii in Etruria. He contrived to remove all the members of the imperial family who stood between him and power, but having awakened the suspicion of Tiberius, he was executed in A.D. 31.

SELECTMEN, in New England, officers chosen annually to manage the affairs of a town, provide for the poor, etc. A town has usually from three to seven selectmen, who constitute a kind of executive authority.

SELENIUM, a rare chemical element discovered by Berzelius in 1817 in the refuse of a sulphuric acid manufactory near Fahlun, in Sweden. It occurs in several minerals, chiefly in combination with copper, lead, mercury, and silver, and is closely related, in its general chemical deportment to sulphur and tellurium, these three elements forming a group which is characterized by certain well-marked general properties. Selenium takes fire when heated to a tolerably high temperature in air or in oxygen, burning with a blue flame, and with the production of the dioxide. With hydrogen selenium forms the very disagreeably smelling gas seleniuretted hydrogen, the analogue of sulphuretted hydrogen. To selenium the symbol Se and the atomic weight 96.5 are given.

SELIM I., Sultan of Turkey, was the son of Bajazet II., born in 1467, died 1520. Selim was succeeded on the throne by Solyman I.

SELIM III., Sultan of Turkey, son of Mustapha III., was born 1761, assassinated 1808. He succeeded his uncle

Adbul-Hamed in 1789, and attempted reforms in his government after European methods, but wars with Russia, Austria, etc., prevented their being carried out.

SELINUS, one of the most important of the Greek colonies in Sicily, founded probably about 628 B.C. on the southwestern coast of that island.

SELKIRK, or **SELCRAIG**, Alexander, the prototype of "Robinson Crusoe," was born in Largo, Fifeshire, in 1676; died on board the royal ship Weymouth, 1723. He took part in bucaneeering expeditions in the South seas, and in consequence of a quarrel with his captain he was put ashore, at his own request, on the island of Juan Fernandez. There he lived alone for four years and four months, when he was taken off by the captain of a privateer. He returned home in 1712, and his adventures became known to the public. Defoe's Robinson Crusoe appeared in 1719, but Crusoe's experiences have but little in common with those of Selkirk. Selkirk afterward rose to the rank of lieutenant in the navy. A monument was erected to him in his native town in 1885.

SELMA, a city in Dallas co., Alabama, on the Alabama river, 93 miles below Montgomery. It has mills and various manufactories. During the civil war it an important military station, and was taken by the federals in April, 1865. Pop. 10,362.

SELTERS (or Seltzer) **WATER**, a mineral water found naturally in the village of Niederselters, in the German province of Hesse-Nassau, and elsewhere, but also largely manufactured. Its chief ingredients are carbonic acid, carbonate of soda, and common salt. It acts as a mild stimulant of the mucous membranes, and as a diuretic.

SEM'APHORE, a term originally applied to telegraphic or signalling machines the action of which depended upon the motion of arms round pivots placed at or near their extremities. Many kinds of semaphores were in use before the invention of the electric telegraph, and a simple form is still employed on railways to regulate traffic at or near stations.

SEM'IBREVE, in music, a note of half the duration or time of the breve. The semibreve is the measure note by which all others are now regulated. It is equivalent in time to two minims, or four crotchets, or eight quavers, or sixteen semiquavers, or thirty-two demisemiquavers. See Music.

SEM'ICOLON, in grammar and punctuation, the point (;), the mark of a pause to be observed in reading or speaking, of less duration than the colon, and more than that of the comma. It is used to distinguish the conjunct members of a sentence.

SEM'INOLES, a tribe of North American Indians, an offshoot from the Choctaw Muskogees. They separated from the confederation of the Creeks, settled in Florida 1750 under the name of Seminoles, that is, fugitives. They were subsequently joined by other Indians as well as negroes, and in 1822 they numbered 3900 souls. As a punishment for their continual plundering and murdering of the white settlers,

General Jackson was sent against them in 1818. They latterly sold their lands and agreed to be transferred beyond the Mississippi, but refused to implement their agreement, and under their chief Osceola carried on a long and determined resistance. At last they were finally driven from the Everglade morasses by United States troops, and obliged to succumb in 1842, when all but a scanty remnant were transferred to the Indian territory, where they now form an industrious community.

SEMPALATINSK, or **SEMPOLATINSK**, a town of Central Asia, on the Irtysh. It consists chiefly of wooden buildings facing the river, and carries on a considerable trade with the Kirghis and with Tashkend, Khokand, Bokhara, and Kashgar. Pop. 26,353.—The province of Semipalatinsk has an area of 198,192 sq. miles, and a population of 685,197, chiefly Kirghiz, Cossacks, etc. It is mountainous in the southeast, consists of steppe land in the northwest, and is one of the warmest of Russian Asia in summer, though the winter is rather extreme. The chief occupation of the people is cattle-rearing.

SEMIQUAVER, in music, a note half the length of the quaver. See Music.

SEMI'RAMIS, a queen of Assyria whose history is enveloped in fable. As the story goes, she was a daughter of the fish-goddess Derceto of Ascalon, in Syria, by a Syrian youth. Being exposed by her mother, she was miraculously fed by doves until discovered by the chief of the royal shepherds, who adopted her. Attracted by her beauty Onnes, governor of Nineveh, married her. She accompanied him to the siege of Bactra, where, by her advice, she assisted the king's operations. She became endeared to Ninus, the founder of Nineveh (about B.C. 2182), but Ninus refused to yield her, and being threatened by Ninus, hanged himself. Ninus resigned the crown to Semiramis, and she was proclaimed queen of Assyria. She built Babylon, and rendered it the mightiest city in the world. She was distinguished as a warrior, and conquered many of the adjacent countries. Having been completely defeated by the Indus, she was either killed or compelled to abdicate by her son Ninyas after reigning forty-two years. According to popular legend she disappeared or was changed into a dove, and was worshiped as a divinity. Her whole history resembles an oriental tale, and even her existence has been questioned. She is probably a mythological being corresponding to Astrate, or the Greek Aphrodite.

SEMITIC LANGUAGES, the languages belonging to the Semites, Semitic peoples, that is those regarded as descendants of Shem. The Semitic languages form an important linguistic family, which is usually divided into northern and a southern section. The northern belong to the ancient dialects of Assyria and Babylonia (recovered means of the cuneiform inscriptions the Hebrew, with the Samaritan and Moabitic; the Phœnician and Carthagenian; and lastly the Aramaic, which includes the Chaldee and the Syriac). The northern Semitic languages are

almost entirely extinct as spoken languages, though Hebrew is to some extent still used in writing. The most important of the south Semitic tongues, and the only one now in extensive use, is the Arabic, which as a spoken language may be divided into the four dialects of Arabia, Syria, Egypt, and Barbary. To this branch also belong the Mimyaritic, formerly spoken in part of Arabia, the Ethiopic, or ancient ecclesiastical language of Abyssinia, and the Amharic and other modern dialects of the same country. The most prominent characteristic of the Semitic tongues is the trilateralism of their roots, that is, the peculiarity that their roots regularly consist of three consonants which always remain unchanged, the various words and word forms being produced by the insertion of the vowels between the consonants of the root. Another peculiarity is the absence of compound words.

SEMMES, Raphael, American naval officer, born 1809, died 1877. He entered the navy in 1832, having previously studied law; took part in the Mexican war, and on the outbreak of the civil war joined the confederate service, and gained much prominence from his feats in command of the Sumter and the Alabama. He was imprisoned after the war, but gained his liberty at the amnesty. The rest of his life was devoted to law practice. He was the author of *Service Afloat and Ashore*, *Cruise of the Alabama* and *Sumter*, etc.

SENATE, originally the supreme legislative body of ancient Rome, first instituted according to tradition by Romulus. Tarquinius Priscus is said to have increased the number of members from 100 to 300, thus making 100 representatives for each of the Patrician tribes. Under the republic the consuls, consular tribunes, and later the censors, had the power of choosing the senators; but they were restricted to those who had previously held magistracies, and as the magistrates were chosen by popular election the senate was ultimately a representative body. Curule magistrates and quæstors had a seat *ex officio* in the senate, and a right to speak, but not to vote. In the administration of affairs the senate was supreme, and during national crises could invest the consuls with absolute and dictatorial authority. A decree of the senate was called *senatus consultum*. The number of senators necessary to form a quorum during the republic is uncertain. After this body had remained for several centuries at 300, their number was raised by Sulla to 600, he having added 300 equites to the senate. Julius Cæsar made a further increase of 300, and at one time there were 1000, but Augustus lowered their number to 600, and required the presence of 400 to constitute a full assembly. He afterward further reduced them, and later 70 members were considered sufficient. The majority of votes always decided a question. Latterly, under the republic, the tribunes of the people could veto every proposition before the senate. Under the emperors the senate gradually lost its political consideration; finally it often accepted and passed the imperial decrees without deliberation. In modern

times the term is applied to the upper or less numerous branch of a legislature in various countries, as in France, in the United States, in most of the separate states of the Union, and in some of the Swiss cantons. It is also used to designate the governing body of certain universities.

SEN'ECA, a lake in the western part of New York state, 25 miles s. of Lake Ontario, into which its waters flow. It is about 37 miles long, from 2 to 4 miles broad, and 630 feet deep. It communicates with the Erie canal, and steamers ply upon it.

SEN'ECA, Lucius Annæus, called Seneca the philosopher, son of the following, was born at Corduba (Cordova) A.D. 3. The good government of the first years of Nero's reign was largely due to Seneca (though Seneca had consented to the assassination of Nero's mother), but he lost his influence, and being accused of complicity in the conspiracy of Piso he was forced to commit suicide (A.D. 66).

SENECA, Marcus Annæus, rhetorician and the father of the preceding, was a native of Corduba, in Spain, and was born about 61 B.C. He died at Rome toward the close of the reign of Tiberius (A.D. 37). He was the author of a collection of extracts showing the treatment of school themes by contemporary rhetoricians, but of no importance as literature.

SENECA INDIANS, a tribe originally inhabiting the western part of New York state, and belonging to the Six Nations. They number upward of 3000 on New York reservations, and a small band are in the Indian territory.

SEN'EFELDER, Aloys, the inventor of lithography, born at Prague 1771, died at Munich 1834.

SEN'EGA, or **SEN'EKA**, a plant common in the United States. It has a woody, branched, contorted root, about $\frac{1}{2}$ inch in diameter, and covered with ash-colored bark. This has been cele-



Senega.

brated as a cure for the bite of the rattlesnake. Medically it is considered stimulating, expectorant, and diuretic, and is now almost exclusively used in cough mixtures, being similar in its effect to squill.

SEN'EGAL, a river of Western Africa, which rises in the interior not far from some of the Niger sources, and after a course of some 1000 miles falls into the Atlantic near lat. 16° n. It is navigable for about 700 miles from its mouth, as far as the cataracts of Félou, beyond

which its capabilities have not been ascertained.

SENEGAL, a French colonial dependency in West Africa, in Senegambia, comprising the island and town of St. Louis, at the mouth of the Senegal, several forts along the banks of that river, the island of Goree, Albuda on the Gambia, and other stations south of Cape Verd. Area (including dependencies), 140,000 sq. miles. Pop. 2,000,000.

SENEGAM'BIA, an extensive region of Western Africa, comprising the countries between lat. 8° and 17° n.; lon. 4° and 17° 30' w.; bounded n. by the Sahara, e. by Soudan, s. by Guinea, and w. by the Atlantic. Rice, maize, and other grains, with bananas, manioc, and yams are grown, while the orange, citron, and other fruits introduced by the Portuguese are now extensively cultivated on the hills. Wild animals comprise the elephant, hippopotamus, monkeys, antelopes, gazelles, lion, panther, leopard, hyenas, jackal, crocodile, etc. The climate is intensely hot, and very unhealthy for Europeans. The region may be divided into French Senegambia (Senegal and territories protected or under French influence); British Senegambia (Sierra Leona, Gambia, etc.); Portuguese Senegambia (Bissao, Casamanza, etc.); and Liberia. The total population of Senegambia is estimated at 12,000,000, and its area at perhaps 700,000 sq. miles.

SENILITY, in man special physiological conditions and pathological changes mark the decline of life and the approach of old age. Death never results from old age. In all cases some lesion points the way to the cause of death. The precautions to be taken against the rapid advance of age include avoidance of alcohol during one's whole life; moderate eating, especially after the age of forty; moderate exercise after the age of sixty is reached, or after senescence has begun to manifest itself; avoidance of strain, physical or mental; avoidance of worry, anger, and grief; proper clothing for all seasons and conditions, and other avoidance of exposure; together with out-of-door air.

SENNA, a substance used in medicine, consisting of the leaflets of several species of Cassia, but the exact botanical source of some of the commercial kinds



Senna.

is still uncertain. Alexandrian senna is grown in Nubia and Upper Egypt, and imported in large bales from Alexandria. It is frequently adulterated with the leaves of other plants.

SENNAAR', or **SENAAR'**, a region of Africa, in the Soudan, area about 115,000 sq. miles, between the Bahr-el-Azrek, or Blue Nile and the Bahr-el-Abiad, or White Nile. The population, estimated at 1,500,000, is greatly mixed.

SENSATION, the name applied to indicate the consciousness of an impression produced on sensory nerve fibers (See Nerve.) An impression might be produced upon a sensory nerve and transmitted to a nerve center, leading to stimulation of the center and to some subsequent change, but if no consciousness of such existed it could not be called a sensation. Thus, an impression made on an organ of sense might reach a lower nerve center, and by reflex action induce a muscular movement, while the centers devoted to consciousness being asleep or preoccupied remained unaffected. To this kind of impression the term sensation is not applicable. The external organs by means of which particular kinds of impressions are primarily received, and thence transmitted to the brain, are called the organs of the senses; these are the eye, the ear, the nose, and the tongue, besides the nerves dispersed under the common integument, which give rise to the common sensation feeling or touch. This last is of a more general kind than the others, making us aware of heat and cold, rough and smooth, hard and soft, etc. In addition to these, according to Professor Bain, "the feelings connected with the movements of the body, or the action of the muscles, have come to be recognized as a distinct class, differing materially from the sensations of the five senses. They have been regarded by some metaphysicians as proceeding from a sense part, a sixth or muscular sense." Of the sensations which are most readily perceived by animals that of resistance or touch is perhaps the most widely diffused. By the resisting feel of matter we judge of its shape and of its other attributes. Next to resistance sensibility to heat is the best defined and most frequently displayed sensation. The sense of consciousness of light or luminosity succeeds that of temperature; taste comes next in order; then hearing; while smell is probably one of the least diffused of sensations. The special senses and the structure of the organs of sense are described under the headings Eye, Ear, Nose, Smell, Touch, etc. (which see).

SENSES. See special articles Eye, Ear, Nose, Smell, Touch, etc.; also Nerve, Sensation, etc.

SENSITIVE FLAMES, gas flames which are easily affected by sounds, being by them made to lengthen out or contract, or change their form in various ways. The most sensitive flame is produced in burning gas issuing under considerable pressure from a small taper jet. Such a flame will be affected by very small noises, as the ticking of a watch held near it, or the chinking of small coins 100 feet off. The gas must be turned on so that the flame is just at the point of roaring.

SENSITIVE PLANT, a plant celebrated for its apparent sensibility, a native of tropical America. The leaves are compound, consisting of four leaves,

themselves pinnated, uniting upon a common footstalk. At the approach of night the leaflets all fold together; and the common footstalk bends toward the stem; at sunrise the leaves gradually unfold, and recover their usual state. So far, this is evidently the effect of light, but the same phenomena take place on touching the plant roughly, only that it recovers itself in a short period. The same property belongs to other species of *Mimosa* and to species of other genera.

SENTENCE, in grammar, a combination of words which is complete in itself as expressing a thought or proposition, and in writing is marked at the close by a full point. It is the unit or ground-form of speech. According to the grammars a sentence must always contain two members—the subject or thing spoken of, and the predicate or that which is enunciated regarding the subject. Accordingly every sentence must have a finite verb, though in impassioned language the verb is frequently understood. Sentences are distinguished into simple, complex, and compound. A simple sentence has only one subject and one finite verb, as "The man is brave." This may be more or less expanded by the use of adjuncts, and still retain its character of a simple sentence. A complex sentence is a principal sentence with one or more subordinate sentences, as "The man, who is truly patriotic, will risk his life for his country." A compound sentence consists of two or more simple sentences connected by conjunctions, as "The sun rises in the east and sets in the west." It differs from the complex sentence in having its clauses co-ordinate, and not, as in the other, in subordination to a principal clause.

SENTRY, or **SENTINEL**, a soldier set to watch or guard an army, camp, or other place from surprise, by observing and giving notice of the approach of danger. At night each sentinel is furnished with the countersign (a certain word or phrase), and no one may pass him without giving this signal.

SE'PAL, in botany, one of the separate divisions of a calyx when that organ is made up of various leaves. When it consists of but one part the calyx is said to be monosepalous; when



s s, Sepals.

of two or more parts, it is said to be di-, tri-, tetra-, pentasepalous, etc. When of a variable and indefinite number of parts, it is said to be polysepalous.

SEPIA, a genus of Cephalopoda or cuttle fishes, included in the family Sepiadæ. These cephalopods, of which the common sepia is a typical example, belong to the dibranchiate or "two-gilled" section of their class, and to the group of decapoda or "ten-armed" forms. The family Sepiadæ possesses an inter-

nal calcareous shell, the so-called sepio-staire or "cuttle-fish bone," which is often cast up upon some coasts, and was formerly in repute as an antacid in medicine, and as the source of the "pounce" once used for spreading over eroded ink marks to form a smooth surface for the corrected writing. There are four rows of pedunculated suckers on the arms of the genus *Sepia*. Lateral fins exist. The two tentacles or arms, which are longer than the remaining eight, possess suckers at their expanded extremities only. The eggs of the sepia resemble bunches of grapes in form, and hence are sometimes called "sea-grapes." The eggs are each protected in a leathery capsule. The common sepia occurs on the southern English coasts, but more especially in the Mediterranean sea. It is chiefly sought after on account of the inky matter which it affords. This secretion, which is insoluble in water, but extremely diffusible through it, is agitated in water to wash it, and then allowed slowly to subside, after which the water is poured off, and the black sediment is formed into cakes or sticks. When prepared with caustic lye it forms a beautiful brown color, with a fine grain, and has given name to a species of monochrome drawing now extensively cultivated.

SE'POYS, the name given to the native forces in India. The native Indian army—infantry, cavalry, artillery, and sappers and miners—now numbers 145,683 men, including 2795 native officers, and 1580 European officers. Though not generally equal in courage and dexterity to European soldiers, the sepoys are hardy and enduring, and very temperate in their food.

SEPTEMBER (from the Latin septem, seven), the ninth month of our year, but the seventh of the old Roman year, which began in March. It has always contained thirty days.

SEPTUAGINT, or the LXX., the Version of the Seventy, the Alexandrine Version, etc., is the oldest Greek version of the Old Testament. It is so called either because it was approved and sanctioned by the sanhedrim, or supreme council of the Jewish nation, which consists of about seventy members, or because, according to tradition, about seventy men were employed on the translation. The language is the Hellenistic Greek of Alexandria, based upon the Attic dialect. The translation is reported by Josephus to have been made in the reign and by the order of Ptolemy Philadelphus, king of Egypt, about 270 or 280 years before the birth of Christ. It is believed, however, by modern critics that the Septuagint version of the several books is the work, not only of different hands, but of separate times. It is probable that at first only the Pentateuch was translated, and the remaining books gradually. The Septuagint was in use up to the time of our Savior, and is that out of which most of the citations in the New Testament from the Old are taken. It is an invaluable help to the right understanding of the Hebrew Scriptures. The principal extant MSS. known are the Codex Alexandrinus in the British museum, the Codex Vaticanus in Rome, and the

Codex Sinaiticus (imperfect) in St. Petersburg. The principal printed editions are the Complutensian (1514-17), the Aldine (Venice, 1518), the Roman or Sextine (1587), and the new Cambridge (1887-95).

SEPULCHRAL MOUND. See Tumuli, Barrow.

SEQUENCE, in music the recurrence of a harmonic progression or melodic figure at a different pitch or in a different key to that in which it was first given. In the Roman Catholic church the term sequence is applied to a hymn introduced into the mass on certain festival days.

SEQUO'IA (from the American Indian Sequoyah, who invented the Cherokee alphabet), a genus of conifers, otherwise called Wellingtonia or Washingtonia, consisting of two species only—the redwood of the timber trade, and the Wellingtonia, the big or mammoth tree of the western states, the latter having been discovered in the Sierra Nevada in 1852. One specimen in Calaveras co., Cal., has a height of 325 feet, and a girth 6 feet from the ground of 45 feet. The Mariposa Grove, 16 miles south of the Yosemite valley, contains upward of 100 trees over 40 feet in circumference and one over 93 feet at the ground, and 64 feet at 11 feet higher. This grove is government property. Some of these trees indicate an age of over 2000 years.

SERAGLIO (se-ral'yō), properly Serai, the palace of the Turkish sultan at Constantinople. It stands in a beautiful situation, on a point of land projecting into the sea. Its walls embrace a circuit of about 9 miles, including several mosques, spacious gardens, the harem, and buildings capable of accommodating 20,000 men, though the number of the sultan's household does not amount to above 10,000. The principal gate of the seraglio is called Babi Humayum (Sublime Porte).

SERAING (sè-ran), a town of Belgium, in the province of Liège, 3 miles southwest of Liège, on the Meuse. Cockerill's extensive iron, steel, and machine works (including also coalpits), employing 12,000 hands, are established here, and other industries are carried on. Pop. 67,942.

SER'APH, plural Seraphim, a name applied by the prophet Isaiah to certain attendants of Jehovah in a divine vision presented to him in the temple (Isa. vi. 2). Very commonly by these seraphim have been understood to be angels of the highest order—angels of fire. The term seraphim is only used elsewhere of the serpents of the wilderness (Num. xxi. 6, 8 and Deut. viii. 15).

SERA'PIS, or **SARA'PIS**, an Egyptian deity whose worship was introduced into Egypt in the reign of Ptolemy I. Forty-two temples are said to have been erected to him in Egypt under the Ptolemies and Romans; his worship extended also to Asia Minor, and in 146 A.D. it was introduced to Rome by Antonius Pius. The image of Serapis perished with his temple at Alexandria, which was destroyed in 389 by the order of Theodosius.

SERENADE, music performed in the open air at night; often, an entertainment of music given in the night by a

lover, to his mistress under her window; or music performed as a mark of esteem and good will toward distinguished persons. The name is also given to a piece of music characterized by the soft repose which is supposed to be in harmony with the stillness of night. The Italian name Serenata is now applied to a cantata having a pastoral subject, and to a work of large proportions, in the form to some extent of a symphony.

SERFS, a term applied to a class of laborers existing under the feudal system, and whose condition, though not exactly that of slaves, was little removed from it. Under this system, from the vassals of the king downward, the whole community was subject only on condition of specific services to be rendered to his superior that any individual held his fief. In the case of the lower classes this servitude amounted to an almost complete surrender of their personal liberty. There were two classes of laborers, the villeins and the serfs proper. The former occupied a middle position between the serfs and the freemen. Hallam remarks, in reference to these two classes, that in England, at least from the reign of Henry II., one only, and that the inferior, existed; incapable of property and destitute of redress except against the most outrageous injuries. A serf could not be sold, but could be transferred along with the property to which he was attached. The revival of the custom of manumission counteracted the rapid increase of serfs. A serf could also obtain his freedom by purchase, or by residing for a year and a day in a borough, or by military service. By these various means the serf population gradually decreased. In most parts of the continent they had disappeared by the 15th century. The extinction of serfdom in England and Scotland was very gradual. As late as 1574 Elizabeth issued a commission of inquiry into the lands and goods of her bondsmen and bondswomen in specified counties in order to compound for their manumission; and even in the 18th century, a species of serfdom existed among Scottish minors. Serfdom in Russia was abolished by a manifesto of Alexander II. on March 17, 1861.

SERGEANT, a non-commissioned officer in the army, ranking next above the corporal. He is appointed to see discipline observed, to teach the soldiers their drill, and also to command small bodies of men, as escorts and the like. A company has four sergeants, of whom the senior is called color-sergeant. Staff-sergeants are higher than these, and above all is the sergeant-major, who acts as assistant to the adjutant.

SERGIPE (ser-zhē'pe), or **SERGIPE-DEL-REY**, a maritime state of Brazil, n. of Bahia; area, 12,034 sq. miles. The coast is low and sandy, but the interior is mountainous. The chief river is the Sao-Francisco on the north. Cotton, sugar cane, rice, tobacco, etc., are grown, and the woods furnish good timber, dyewoods, and quinine. Pop. 311,170. The chief town is Aracajú; pop. 5000.

SERIE'MA, a gallatorial bird of the size of a heron inhabiting the open grassy

plains of Brazil and other parts of South America. Its feathers are of a gray color, and a kind of crest rises from the root of the beak, consisting of two rows of fine feathers curving backward. The eye is sulphur-yellow, the beak and feet red. It is of retired habits, and utters



Seriema.

a loud screeching cry, which somewhat resembles that of a bird of prey or the yelping of a young dog. The seriema is protected in Brazil on account of its serpent-killing habits and is often domesticated.

SERINGAPATAM' (properly, Sir-ranga-patanam, "city of Vishnu"), a celebrated town and fortress in the province of Mysore, Madras presidency, India. Pop. 10,594, once 140,000.

SEROUS MEMBRANES are certain double membranes in the human body, as the pleura, pericardium, peritoneum, etc., which form a sort of closed sac surrounding certain organs, the interior surfaces of the sac secreting a small quantity of serous fluid. Their chief function is to allow free action to the organs, and they are also intimately connected with the absorbent system, the vessels of which freely open on their surfaces. These membranes are liable to various diseases, as inflammation (pleurisy, pericarditis, etc.), morbid growths, dropsical effusions, hæmorrhage, etc.

SERPENT-CHARMING, an art of great antiquity, confined in practice exclusively to eastern countries. Several allusions are made to it in the Bible, as Ps. lviii. 5; Eccl. x. 11; Jer. viii. 17, and also in classical writers. The power exercised by the charmers over poisonous serpents is unquestionably remarkable, and though there is little doubt that the common practice of the charmer is to extract the fangs before exhibiting their feats, yet we have good authority for believing that it is not unusual to dispense with this. The instrument usually employed in serpent-charming is a kind of pipe, which is varied by whistling and the use of the voice. The effect of this medley of sounds is to entice the serpents from their holes, and this done the serpent-charmer pins them to the ground with a forked stick. In India and other places the art of serpent-charming is an hereditary profession,

and is practiced for the purpose of gaining a livelihood by administering to the amusement of the public. Besides the evident power music has upon the serpents, they appear to be influenced in a marked degree by the eye of the charmer who controls them by merely fixing his gaze upon them.

SERPENT EATER. See Secretary Bird.

SERPENTS, or SNAKES, an order of reptiles, characterized by an elongated and cylindrical body covered with horny scales, but never with bony plates. There is never any breast bone nor pectoral arch, nor fore-limbs, nor as a rule any traces of hind-limbs. In a few cases, however (as in the python), rudimentary hind-limbs may be detected. The ribs are always numerous, some serpents having more than 300 pairs. These not only serve to give form to the body and aid in respiration, but are also organs of locomotion, the animal moving by means of them and of its scales which take hold on the surface over which it passes. The vertebræ are formed so as to give great pliancy, most if not all serpents being able to elevate a large portion of their body from the ground. They have hooked, conical teeth, not lodged in distinct sockets useless for mastication, but serving to hold their prey. In the typical non-poisonous or innocuous serpents, both jaws and the palate bear continuous rows of solid conical teeth. In the venomous serpents, as vipers, rattlesnakes, etc., there are no teeth in the upper jaw excepting the two poison fangs. These are long, firmly fixed in a movable bone, above which there is a gland for the elaboration of poison. Each tooth is perforated by a tube through which the poison is forced. The tongue, which is forked, and can be protruded and retracted at pleasure, is probably rather an organ of touch than of taste. The eye is unprotected by eyelids, but it is completely covered and protected by an anterior layer of transparent skin attached above and below to a ridge of scales which surround the eye. No external ear exists. The nostrils are situated on the snout. The heart has three chambers, two auricles and a ventricle. The digestive system comprises large salivary glands, a distensible gullet, stomach, and intestine, which terminates in a cloaca with a transverse external opening. A urinary bladder is absent. The lungs and other paired or symmetrical organs of the body generally exhibit an abortive or rudimentary condition of one of these structures. As regards reproduction they are either oviparous or ovoviviparous, the eggs being either hatched externally or within the animal's body. Many serpents, especially the larger species, as the boas, subsist on prey thicker than themselves, which they crush by constriction, and which they are able to swallow from the throat and body being capable of great dilatation. The order is generally divided into two sub-orders, Viperina and Colubrina, the former having only two poison fangs in the upper jaw, the latter having solid teeth, besides grooved fangs. The different kinds or species of snakes will be found described in articles under

their respective headings, such as Rattlesnake, Python, etc. See also Reptiles.

SER'PULA, a genus of Annelida or worms, belonging to the order Tubicola or tube-dwelling worms, inhabiting cylindrical and tortuous calcareous tubes attached to rocks, shells, etc., in the sea. The worm fixes itself within



Serpula, detached and in tube.

its tube by means of the bristles attached to its body-segment. Its head segments are provided with plume-like gills or granchiæ. No eyes exist in this creature, although it is extremely sensitive to the action of light.

SERTO'RIUS, Quintus, a Roman general, born about 120 B.C. After serving with reputation under Marius against the Teutones in Spain he was made questor in Cisalpine Gaul in 91 B.C. He was treacherously assassinated at a feast by his friend Perperna B.C. 72. Sertorius has been made the subject of a tragedy by Corneille.

SERUM, the thin transparent part of the blood. The serum of the blood, which separates from the crassamentum during the coagulation of that liquid, has a pale straw color, or greenish-yellow color, is transparent when carefully collected, has a slightly saline taste, and is somewhat unctuous to the touch. It usually constitutes about three-fourths of the blood, the pressed coagulum forming about one-fourth. The term is also applied to the thin part of milk separated from the curd and oil. See Blood.

SERVAL, or **BUSH CAT**, a carnivorous animal nearly related to the leopard and its allies, a native of Africa. Its general body color is a bright yellow or golden luster, with a grayish tint, and



Serval.

marked with black spots. The average length is about 2 feet 10 inches including the thick bushy tail, which is from 10 to 12 inches long. This animal is readily domesticated. Its fur is in great request,

and obtains high prices. The name of tiger cat is frequently applied to the serval.

SERVE'TUS, Michael (properly Miguel Serve), a learned Spaniard, memorable as a victim of religious intolerance, was born in 1509 at Villa Neuva, in Arragon. He was arrested for heresy and imprisoned in 1553, but contrived to escape, and purposed to proceed to Naples. He was, however, apprehended at Geneva on a charge of blasphemy and heresy, and his various writings were sifted in order to ensure his condemnation. The divines of all the Protestant Swiss cantons unanimously declared for his punishment, and Calvin was especially urgent and emphatic as to the necessity of putting him to death. As he refused to retract his opinions he was burnt at the stake on the 27th October, 1553. Servetus is numbered among the anatomists who made the nearest approach to the doctrine of the circulation of the blood.

SERVIA, an independent kingdom of Eastern Europe, bounded n. by Austria-Hungary, from which it is separated by the Save and the Danube; e. by Roumania and Bulgaria; s. by Turkey; and w. by Bosnia; area, 18,855 sq. miles; pop. 2,535,915. The surface is elevated and is traversed by ramifications of the Carpathians in the northeast, of the Balkans in the southeast, and of the Dinaric Alps in the west. The summits seldom exceed 3000 feet, though the highest reaches 6325. The chief agricultural products are corn, wheat, flax, hemp, and tobacco. Wine is grown in the districts adjoining Hungary, and the cultivation of prunes is extensive. Lead, zinc, quicksilver, copper, iron, and coal are found. Manufactures include carpet-weaving, embroidery, jewelry, and filigree work. The principal exports are dried prunes, pigs, wool, wheat, wine, hides, cattle, and horses; imports, cotton, sugar, colonial goods, hardware, etc. The bulk of the trade is with Austria. There are 340 miles of railway and 1800 miles of telegraph. The great majority of the inhabitants are Slavonians, and adhere to the Greek church. The standing army numbers about 18,000 men, with a reserve of 155,000 men. Servia is divided into fifteen (formerly twenty-two) administrative districts, of which Belgrade (the capital) forms one by itself. Other principal towns are Nisch, Leskovatz, and Pozarevatz.

Servia was anciently inhabited by Thracian tribes; subsequently it formed part of the Roman province of Mœsia. It was afterwards occupied in succession by Huns, Ostrogoths, Lombards, Avars and other tribes. The Servians entered it in the 7th century, and were converted to Christianity in the next century. They acknowledged the supremacy of the Byzantine emperors, but latterly made themselves independent and under Stephen Dushan (1336-56), the Kingdom of Servia included all Macedonia, Albania, Thessaly, Northern Greece, and Bulgaria. About 1374 a new dynasty ascended the throne in the person of Lazar I., who was captured by the Turks at the battle of Kossova (in Albania) in 1389, and put to death.

Servia now became tributary to Turkey. About the middle of the 15th century it became a Turkish province, and so remained for nearly 200 years. By the Peace of Passarowitz in 1718 Austria received the greater part of Servia, with the capital, Belgrade. But by the Peace of Belgrade in 1739 this territory was transferred to Turkey. The barbarity of the Turks led to several insurrections. Early in the 19th century Czerny George placed himself at the head of the malcontents, and, aided by Russia, succeeded after eight years of fighting in securing the independence of his country by the Peace of Bucharest, May 28, 1812. The war was renewed in 1813, and the Turks prevailed. In 1815 all Servia rose in arms under Milosh, and after a successful war obtained complete self-government, Milosh being elected hereditary prince of the land. Milosh was compelled to abdicate in 1839, and was nominally succeeded by his son Milan, who died immediately, leaving the throne vacant to his brother Michael. In 1842 this prince was compelled to follow the example of his father and quit the country, Alexander Kara-Georgevitch, son of Czerny George, was elected in his room; but in December, 1858, he also was forced to abdicate. Milosh was then recalled, but survived his restoration little more than a year. His son Michael succeeded him (1860), but was assassinated by the partisans of Prince Alexander on July 10, 1868. The princely dignity was then conferred on Milan (Obrenovitch), grand-nephew of Milosh. After the fall of Plevna in the Russo-Turkish war of 1877-78 Servia took up arms against Turkey, and by the Treaty of Berlin (13th July, 1878) it obtained an accession of territory and the full recognition of its independence. It was erected into a kingdom in 1882. In 1885 a short war took place between Servia and Bulgaria, resulting in favor of the latter. In 1889 Milan abdicated in favor of his son Alexander I. He and his queen were assassinated in 1903, and Peter Kara-Georgevitch succeeded.

SES'AMUM, or **SES'AME**, a genus of annual herbaceous plants, natural order Pedaliaceæ. The species, though now cultivated in many countries, are natives of India. They have alternate leaves and axillary yellow or pinkish solitary flowers.

SESOS'TRIS, a name given by the Greeks to an Egyptian king, who is not mentioned by that name on the monuments, and who is often identified with Ramses II. See Ramses.

SES'SILE, in zoology and botany, a term applied to an organ attached or

leaf, one issuing directly from the main stem or branch without a petiole or footstalk; a sessile flower, one having no peduncle; a sessile gland, one not elevated on a stalk.

SEVEN STARS. See Pleiades.

SEVENTH-DAY BAPTISTS. See Baptists and Sabbatarians.

SEVENTY, The. See Septuagint.

SEVEN WONDERS OF THE WORLD, an old designation of seven monuments, remarkable for their splendor or magnitude, generally said to have been: the pyramids of Egypt, the walls and hanging gardens of Babylon, the temple of Diana at Ephesus, the statue of the Olympian Jupiter at Athens, the Mausoleum at Halicarnassus, the Colossus of Rhodes, and the Pharos or lighthouse of Alexandria.

SEVEN YEARS' WAR, the war carried on from 1756-63, by Frederick the Great of Prussia, in alliance with England, against Austria, Russia, France, Sweden and most of the smaller German states. The war was closed by the Peace of Paris (February 10, 1763), by which England obtained Canada from France, and Florida (in exchange for Havannah) from Spain; and by the treaty of Hubertsburg (February 15), by which Prussia obtained Silesia. The Seven Years' war raised Prussia to the rank of a Great Power.

SEVERN, the second largest river in England, formed by the union of two small streams which rise in Mount Plinlimmon, Montgomeryshire. It flows through Montgomeryshire, Shropshire, Worcestershire, and Gloucestershire, passing the towns of Newton, Welshpool, Shrewsbury, Worcester, Tewkesbury, Gloucester, and Bristol, and after a circuitous southerly course of about 210 miles falls into the Bristol channel. It receives the Tern, Upper Avon, and Lower Avon on the left, and the Teme and Wye on the right. Its basin has an area of 8580 sq. miles. A railway tunnel $4\frac{1}{2}$ miles long has been driven below the river from near Avonmouth, in Gloucestershire, across to Monmouthshire, and a railway bridge 3581 feet long crosses the river at Sharpness higher up.

SEVILLE (se-vil'), **SEVILLA** (se-vêl'-yà), a city of Spain, in Andalusia, on the left bank of the Guadalquivir, capital of a province of the same name, 62 miles n.e. of Cadiz. It is largely built in the Moorish style, with narrow, ill-paved streets, the old Moorish houses having spacious interior courtyards with a fountain in the middle. The city has a large and handsome Gothic cathedral dating from the 15th century, with its famous Moorish Giralda or tower, part of a mosque which gave place to the present cathedral, and dating from 1196; an alcazar or palace in the Moorish style; an exchange called the Casca Lonja; a bull ring, a fine stone building holding 12,000 persons; an aqueduct of 410 arches built by the Moors, a university, a picture gallery rich in examples of Murillo and Zurbaran, etc. Pop. 148,315.—The province has an area of 5300 sq. miles, and the greater part consists of fertile plains producing all kinds of cereals, seeds, vegetables, oranges and other fruits; wine, oil, tobacco, etc. Large numbers of horses

are reared. The chief river is the Guadalquivir. Minerals include iron,



Seville.—La Giralda and part of the cathedral.

silver, lead, and copper. The chief exports are wheat, barley, oranges, oil, wool, copper, etc. Pop. 555,256.

SEWAGE (sū'āj), the matter which passes through the drain, conduits, or sewers, leading away from human habitations singly, or from houses collected into villages, towns, and cities. It is made up of excreted matter, solid and liquid, the water necessary to carry such away, and the waste water of domestic operations, together with the liquid waste products of manufacturing operations, and generally much of the surface drainage water of the area in which the conveying sewers are situated. Until very recent times human excreta was deposited in outhouses or pits, commonly called cesspools. The invention of water-closets necessitated the use of the sewers and the water-carriage of excreta was until lately regarded as the most satisfactory method of disposing of these matters. It was argued that the oxygen of the air held in solution by the water destroyed the organic matter and rendered it innocuous. But experience has shown that no river in the kingdom can oxidize the excreta of the towns on its banks, and that whenever these are passed into the rivers at some distance from the sea they are apt to become offensive. Sewage, when fresh and freely exposed to the air, is almost inodorous, but once it accumulates putrefaction sets in, it becomes vilely odorous, and pollutes the atmosphere by the production of poisonous gases. To prevent this it has been suggested that all sewers should have a greater fall than at present, and many attempts have been made to prevent the accumulation of gases in sewers by ventilation. Many methods for the ultimate disposal of sewage have been proposed, but these all may be divided into three great classes, viz. precipitation, irrigation, and filtration, since the throwing of sewage into a body of water in order that it may be carried away by currents, diluted and oxygenated, has ceased to hold a place in modern sanitary schemes. The precipitation of sewage, by which the solid matter is



Sessile leaves.



Sessile flower.

sitting directly on the body to which it belongs without a support; as, a sessile

separated from the liquid and used as a manure or otherwise, has been the subject of numerous patents, and many chemicals have been employed for that purpose. Lime, lime and phosphate of alumina, and sulphate of iron have all been used with some degree of success. In the A B C process the sewage is first clarified by blood, charcoal, and clay, and afterwards treated with sulphate of alumina, producing a valuable manure. Irrigation—by which the sewage is directly applied to a piece of ground—has been fully tried in several localities, and many people consider it the most successful solution of the problem as to the ultimate disposal of sewage. The ground is carefully prepared, and the sewage allowed to flow over its surface by gravitation, and by this process the productiveness of the soil is enormously increased. But farmers will only use the liquid when their land requires it; consequently when this system is adopted the local authorities have had to add a farm trust to their many other responsibilities, and the system is generally carried out at a heavy annual loss to the public. Filtration—the purification of sewage by causing it to filter through the earth—has been proposed in cases where land is very valuable or difficult to be secured for the disposal of sewage, on the supposition that this system will only require one acre for every 10,000 inhabitants. As the sewage passes down through the earth the air must of necessity follow it, the oxygen of which will re-aerate the earth and make it again fit for use. In recent systems of filtration the sewage is made to pass through special filter-beds, constructed of such materials as cinders, coke, sand, gravel, etc., the purification of the sewage being assisted by the action of bacteria contained in it. Some methods of dealing with the sewage difficulty are based on the principle of keeping all excremental matters out of the sewers and dealing with them so as to prevent decomposition. Moule's earth-closet has been successfully used in detached houses and villages in Great Britain, but the bulk of material renders it difficult to apply the system in towns. Other systems equally successful render the excreta innocuous by mixing them with charcoal, sweepings, refuse, etc., and manufacturing the mass into manure. Seaweed charcoal has been used instead of earth with satisfactory results. In Hoey's system the soil pipe from the closet flows into a reservoir underground, from which the excreta are removed by pneumatic pressure and manufactured into portable manure. In Leinur's system, now in operation at Leyden, Amsterdam, and other European towns, the excreta are forced by vacuum power into hermetically closed tanks above the floor of the central station. The matter is then conducted by air-tight pipes to drying retorts and reduced to a state of powder, or is de-antant in a fluid form into vessels for immediate transport to the country. With regard to indoor drainage care should be taken to see that each trap connected either with bath, water-closet, sink, or fixed basin is ventilated to the open air, and the pipe from the

bath, sink, or fixed basin should never pass into the trap of the water-closet, as the heated water promotes decomposition. The overflow pipe from the cistern should not open into the soil pipe, and the main soil pipe should be of iron, well covered with protecting composition. Cesspools should in all cases be abolished.

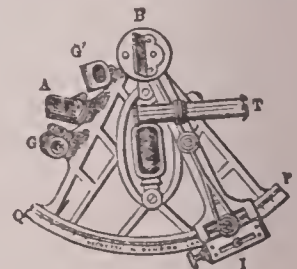
SEWARD (sū'ard), William Henry an American statesman, born at Florida, Orange co., New York, May 16, 1801; died at Auburn, Cayuga co., in the same state, October 10, 1872. He studied for the bar, and began practicing in Auburn in 1823, but gradually drifted into politics, and in 1830 was elected a member of the New York senate. Displaying marked abilities as a politician he was in 1838 and 1840 chosen governor of his native state, and in 1849 was elected to a seat in the United States senate. He was the friend and advisor of President Taylor, and distinguished himself by his firm resistance to the extension of slavery. In 1860 he was a candidate for the presidency, but being defeated in the convention by Abraham Lincoln he exerted himself to secure Lincoln's election. Lincoln afterwards nominated Seward as secretary of state for foreign affairs, in which post he discharged his duties with great ability. He was dangerously wounded in April, 1865, when Lincoln was assassinated, but recovered and fulfilled the same office under Lincoln's successor, Andrew Johnson. He resigned his post on the accession of President Grant in 1869. He wrote a life of John Quincy Adams; his *Speeches, Correspondence, etc.*, appeared in 1869; and an *Autobiography*, with continuation, in 1877.

SEWING MACHINES, the first attempts to devise machines for replacing hand labor in sewing were made early in the 19th century. The first machines were contrivances for imitating mechanically the movements of the hand in sewing. In the machines of Thomas Stone and James Henderson (1804) there were two pairs of pincers, one of which seized the needle below and the other above the cloth, and pulled it quite through on either side alternately. In Heilmann's machine, exhibited at Paris in 1834, the needle had the eye in the middle and a point at each end. The machine was intended for embroidery work. Previous to this (in 1830) Thimmonier and Ferand had contrived a machine producing what is known as the chain stitch. But the great disadvantage of this stitch is that the whole seam becomes undone if the end of the thread is pulled. In 1854 Singer, an American, devised a machine calculated to remedy this defect of the chain stitch by means of a mechanism for tying a knot in the seam at every eighth stitch. But long before Singer's invention Elias Howe, a poor American mechanic, had invented the first really satisfactory sewing machine for which he obtained a patent in May, 1841. Howe's machine used two threads, one of which passed through the eye of the needle, while another was contained in a small shuttle; and it produced a seam in which each stitch was firmly locked, so that it could not come undone by pulling. Many improvements have

since been made by other inventors. The principle of the two threads and the lock-stitch has been adhered to, in most of the machines that have been invented subsequently to that of Howe, but various details applying that principle have been altered for the better. In the Wheeler and Wilson machine the place of the shuttle is supplied by a reel which revolves in a vertical plane within a round piece of mechanism so contrived as to form a loop with the reel-thread, which becomes interlocked with that held by the needle. Of single-thread machines one of the best is that of Wilcox and Gibbs, which, while it is easy, quick, and noiseless in working, makes a securer stitch than one-thread machines generally. Sewing machines have now been adapted to produce almost all kinds of stitching which can be done by the hand. Most sewing machines are worked by the foot, but many are worked by the hand, and some may be worked by either. Steam and electricity are also sometimes employed as a motive power for sewing machines. The manufacture of sewing machines is most extensively carried on in America.

SEX, the name applied to indicate the particular kind of generative or reproductive element in the constitution of an animal or plant, being that property or character by which an animal is male or female. Sexual distinctions are derived from the presence and development of the characteristic generative organs—testes and ovary—of the male and female respectively. See *Reproduction*.

SEXTANT, an improved form of quadrant, capable of measuring angles of 120°. It consists of a frame of metal, ebony, etc., stiffened by cross-braces, and having an arc embracing 60° of a circle. It has two mirrors, one of which is fixed to a movable index, and various other appendages. It is capable of very general application, but it is chiefly employed as a nautical instrument for measuring the altitudes of celestial objects and their apparent angular distances. The principle of the sextant, and of reflecting instruments in general,



Sextant.

depends upon an elementary theorem in optics, viz. if an object be seen by repeated reflection from two mirrors which are perpendicular to the same plane, the angular distance of the object from its image is double the inclination of the mirrors. The annexed figure shows the usual construction of the sextant. *QR* is the graduated arc, *BI* the movable index, *B* mirror fixed to the index, *A* mirror (half-transparent) fixed to the arm, *GG'* colored glasses, that may be interposed to the sun's rays. To find the angle between two stars hold

the instrument so that the one is seen directly through telescope T and the unsilvered portion of the mirror, and move the index arm so that the image of the other star seen through the telescope by reflection from B and A is nearly coincident with the first, the reading on the arc gives the angle required; half degrees being marked as degrees, because what is measured by the index is the angle between the mirrors, and this is half that between the objects.

SEXTON, a corruption of sacristan, an under officer of the church, whose business, in ancient times, was to take care of the vessels, vestments, etc., belonging to the church. The greater simplicity of Protestant ceremonies has rendered this duty one of small importance, and in the Church of England the sexton's duties now consist in taking care of the church generally, to which is added the duty of digging and filling up graves in the churchyard. The sexton may be at the same time the parish clerk.

SEYMOUR, Horatio, American political leader, was born at Pompey Hill, Onondaga co., N. Y., in 1810. In 1842-46 he was mayor of Utica, and in 1852 and 1862 he was elected governor of New York. In 1868 he was president of the democratic national convention which met in New York City and by which he, himself, was nominated for the presidency. He received only 80 electoral votes to 214 for General Grant. He died in 1886.

SHAD, a name of several European fishes, of the family Clupeidæ or herrings, and including two species, the common or allice shad and the twaite shad. The common shad inhabits the sea near the mouths of large rivers, and in the spring ascends them for the purpose of depositing its spawn. The form of the shad is the same as that of the other herrings, but it is of larger size, and in some places receives the name of "herring king." Its color is a dark blue



American shad.

above, with brown and greenish lusters, the under parts being white. The twaite shad is about a half less than the common species, and weighs on an average about 2 lbs. An American species of shad varying in weight from 4 to 12 lbs., is highly esteemed for food, and is consumed in great quantities in the fresh state. They are found all along the coast from New England to the Gulf of Mexico, and have been successfully introduced on the Pacific coast.

SHADOOF, Shaduf, a contrivance extensively employed in Egypt for raising water from the Nile for the purpose of irrigation. It consists of a long stout rod suspended on a frame at about one-fifth of its length from the end. The short end is weighted so as to serve as the counterpoise of a lever, and from the long end a bucket of leather or earthenware is suspended by a rope. The worker dips the bucket in the river, and, aided

by the counterpoise weight, empties it into a hole dug on the bank, from which a runnel conducts the water to the lands to be irrigated. Sometimes two shadoofs are employed side by side. When the waters of the river are low two or more shadoofs are employed, the one above the other. The lowest lifts the water



Raising water by shadoofs.

from the river and empties it into a hole on the bank, a second dips into this hole, and empties the water into a hole higher up, and a third dips into the hole just below, and empties the water at the top of the bank, whence it is conveyed by a channel to its destination.

SHADOW, the figure of a body projected on the ground, etc., by the interception of light. Shadow, in optics, may be defined a portion of space from which light is intercepted by an opaque body. Every opaque object upon which light falls is accompanied with a shadow on the side opposite to the luminous body, and the shadow appears more intense in proportion as the illumination is stronger. An opaque object illuminated by the sun, or any other source of light which is not a single point, must have an infinite number of shadows, though not distinguishable from each other, and hence the shadow of an opaque body received on a plane is always accompanied by a penumbra, or partial shadow the complete shadow being called the umbra. See also Penumbra.

SHAF'TER, William Rufus, American soldier, was born in Michigan in 1835. He enlisted and soon after the outbreak of the civil war was made colonel of volunteers, and in 1865, was brevetted brigadier-general. In 1897 he was promoted to be brigadier-general and commanded the department of California until the beginning of the Spanish-American war, when, he was put in command of the first expedition to Cuba. On July 1st he carried the heights of El Caney and San Juan. On July 3d Cervera's fleet, attempting to escape from Santiago, was destroyed by the American battle ships. Two weeks later the surrender of Santiago took place. In 1901 he was retired with the rank of major-general in the regular army. He died in 1906.

SHAFTESBURY, Anthony Ashley Cooper, first Earl of, was born at Wimborne St. Giles, in Dorsetshire, in 1621,

and succeeded to a baronetcy on the death of his father in 1631. He entered into the plots of the Monmouth party and had to fly to Holland, where he died in 1683. He is the Achitophel of Dryden's famous satire.

SHAFTESBURY, Anthony Ashley Cooper, third Earl of, grandson of the preceding, a celebrated philosophical and moral writer, was born at Exeter House, in London, 1671. In 1708-9 he published several works of a philosophical character, among others a Letter on Enthusiasm and an Inquiry concerning Virtue or Merit. In 1710 his rapidly declining health led him to fix his residence at Naples, where he died in 1713.

SHAG, a species of cormorant, also called the crested or green cormorant, from its dark green plumage. Its average length is about 26 inches, and its nest, composed of roots and stalks of seaweed lined with grass, is usually found on rocky ledges. The young birds have a brownish tint amid the green plumage, with brown and white under-surfaces.

SHAGREEN, a species of leather prepared without tanning, from horse, ass, and camel skin, the granular appearance of its surface being given by imbedding in it, while soft, the seeds of a species of plant, and afterwards shaving down the surface, and then by soaking causing the portions of the skin which had been indented by the seeds to swell up into relief. It is dyed with the green produced by the action of sal-ammoniac on copper filings. It is also made of the skins of the shark, sea otter, seal, etc. It was formerly much used for watch, spectacle, and instrument cases.

SHAH, in Persian, signifies "king." The proper title of the king in Persia is Shah-in-shah, King of kings.

SHAHJEHANPUR, a town in India, in the United Provinces, 95 miles northwest of Lucknow, in the executive district of the same name. There is a cantonment at the place, an American Methodist mission station with churches and schools; and sugar works in the neighborhood. Pop. 76,458.—The district forms a portion of the Rohilkhand Division; has an area of 1744 sq. miles, and pop. of 921,624.

SHAKERS, or **SHAKING QUAKERS**, a sect which arose at Manchester, in England, about 1747, and has since been transferred to America, where it now consists of a number of thriving families. The formal designation which they give themselves is the United Society of Believers in Christ's Second Appearing. The founder of the sect was Ann Lee, an expelled Quaker, born in Manchester in 1756. She went to America in 1774 with seven followers and formed the first settlement at Watervliet, near Albany. They agree with the Quakers in their objections to take oaths, their neglect of certain common courtesies of society, their rejection of the sacraments etc. The societies are divided into smaller communities called families, each of which has its own male and female head. Celibacy is enjoined upon all, and married persons on entering the community must live together as brother and sister. In America there are about twenty communities with between two and

three thousand members, chiefly in the New England states.

SHAKESPEARE, William, English poet and dramatist, was born in 1564, at Stratford-upon-Avon, a town in Warwickshire, England. The first absolutely authentic event in Shakespeare's life is his marriage with Anne Hathaway, daughter of a yeoman in the hamlet of Shottery, near Stratford. The marriage bond is dated November 28, 1582, at which time Shakespeare was in his nineteenth year, while, from the date on her tombstone, it is known that his wife was eight years older. On the 26th May following their first child, named Susanna, was baptized, and in February of 1585 a son and daughter were born, who received the names of Hammet and Judith.

From this date until we find Shakespeare established in London as a player and dramatist there is a gap of seven years, during which we are again left to tradition, and conjecture. The first date in Shakespeare's life after his arrival in London which is settled by clear evidence is 1593. In that year he published his *Venus and Adonis*, with a dedication



William Shakespeare, from monumental bust at Stratford-upon-Avon.

of this "the first heir of my invention," to Henry Wriothesly, earl of Southampton; and in the following year he dedicated to the same patron his other poem of *The Rape of Lucrece*. His fame as a lyrical poet and dramatist was also being securely established. For in 1598 there was published the *Palladis Tamia*, by Francis Meres, in which twelve of his plays are enumerated. Yet, notwithstanding this literary activity, he was still a player, for when Jonson's comedy of *Every Man in his Humor* was produced in 1598, Shakespeare took part in the performance. At what time he ceased to appear upon the stage is not known; we are even left in doubt when he ceased to live in London and retired to Stratford, though this was probably between the years 1610 and 1612. Of his life in Stratford after his return we have no information except doubtful stories and a few scraps of documentary evidence. In February, 1616, his younger daughter Judith married; on the 25th of the following month he

executed his will; and in another month he was dead. He was buried in the chancel of Stratford church, on the north wall of which a monument, with bust and epitaph, was soon afterward set up. The face of this bust, which may have been modeled from a cast taken after his death, was colored, the eyes being hazel, the beard and hair auburn. This bust, and the portrait engraved by Droeshout, prefixed to the first folio edition of his writings (1623), are the chief sources of our information regarding the appearance of the poet. There is also a death-mask dated 1616, and what is known as the Chandos portrait, which are interesting but not authoritative.

In classifying the plays of Shakespeare by the aid of such chronology as is possible, modern critics have found it instructive to divide his career as a dramatist into four marked successive stages. The first period (1588-93) marks the inexperience of the dramatist and gives evidence of experiment in characterization, looseness in the construction of plot, with a certain symmetrical artificiality in the dialogue. To this stage belong:—*Titus Andronicus* (1588-90) and part I. *Henry VI.* (1590-91), both of which, it is thought, Shakespeare merely retouched; *Love's Labor's Lost* (1590); *The Comedy of Errors* (1591); *The Two Gentlemen of Verona* (1592-93); *A Midsummer Night's Dream* (1593-94), parts II. and III. *Henry IV.* (1591-94), in which it is thought probable that Marlowe had a hand; and *King Richard III.* (1593). The second period (1594 to 1601) is that in which, with increased security in his art, the dramatist sets forth his brilliant pageant of English history, his brightest conception of the comedy of life, and more than proves his capacity for deeper things by one great romantic tragedy. To this stage belong: *King Richard II.* (1594); parts I. and II. *Henry IV.* (1597-98); *King Henry V.* (1599); *King John* (1595); *Romeo and Juliet* (1596-97); *The Merchant of Venice* (1596); *Taming of the Shrew* (1597); *Merry Wives of Windsor* (1598); *Much Ado about Nothing* (1598); *As You Like It* (1599); and *Twelfth Night* (1600-1). The third period (1602-8) shows that the dramatist, having mastered all the resources of his art and tasted life to the full, is strangely fascinated by mortal mischance, so that even his comedy becomes bitter, while his tragedy is black with the darkest tempests of passionate human experience. To this stage in his development belong: *All's Well that Ends Well* (1601-2); *Measure for Measure* (1603); *Troilus and Cressida* (1603); *Julius Cæsar* (1601); *Hamlet* (1602); *Othello* (1604); *King Lear* (1605); *Macbeth* (1606); *Antony and Cleopatra* (1607); *Coriolanus* (1608); and *Timon of Athens* (1607-8). The fourth period (1608 to 1613) is that in which Shakespeare, after having passed through a season which was probably darkened by his own personal experience suddenly attained the glad serenity of mind which enabled him to write his last romantic plays. To this period belong: *Pericles* (1608), which is only partly from Shakespeare's hand; *Cymbeline* (1609); *The Winter's Tale* (1610-

11); *The Tempest* (1610); with (the doubtful) *Two Noble Kinsmen* (1612) and *King Henry VIII.* (1612-13), which are partly by another writer, supposed to be Fletcher. Of non-dramatic pieces Shakespeare was the author of *Venus and Adonis* (1593), *The Rape of Lucrece* (1594), the *Sonnets* and *A Lover's Complaint* (1609); while it is agreed that only a few of the poems in the collection published under the name of *The Passionate Pilgrim* (1599) were written by him.

SHALE, a term applied in geology to all argillaceous strata which possess to a greater or less degree the quality of splitting into layers parallel to the planes of deposition. It is the solidified mud of ancient waters, and is various in color and composition, the chief varieties being sandy, calcareous, purely argillaceous, and carbonaceous. Shale is frequently found deposited between seams of coal, and commonly bears fossil impressions. The sub-variety known as bituminous shale burns with flame, and yields an oil, mixed with paraffin, of great commercial importance. Alum is also largely manufactured from the shales of Lancashire, Yorkshire, and Lanarkshire.

SHAMOKIN (shā-mō'kin), a city of Northumberland co., Pa., 40 miles north by east of Harrisburg; on the Lehigh valley, the Northern Central, and the Philadelphia and Reading railroads. It is the center of an extensive anthracite coal-mining industry. Pop. 21,262.

SHAMOY LEATHER, a soft leather prepared from the skins of goats, deer, and sheep (originally the chamois, whence the name) by impregnating them with oil. This leather can be washed without losing its color, and is put to innumerable uses.

SHAMPOOING, the name given in the East Indies to a process connected with bathing, in which the whole body is pressed and kneaded by the hands of the attendants.

SHAMROCK, the name commonly given to the national emblem of Ireland. It is a trefoil plant, generally supposed to be the plant called white clover; but some think it to be rather the wood-sorrel. The plant sold in Dublin on St. Patrick's Day is the small yellow trefoil.

SHAMROCK I., II., and III. three racing yachts owned by Sir Thomas Lipton, built to compete for the American Cup in the international yacht races off Sandy Hook, N. Y. The first Shamrock competed in the 1899 cup races and was defeated by the American yacht *Columbia* in the first three races of the series. Although defeated in the 1901 series by the *Columbia* which was again selected to defend the cup, Shamrock II. came nearer to actual victory than any of its predecessors. Shamrock III. was defeated in the 1903 series by the *Reliance*.

SHANGHAI, or **SHANGHAE** (shang-hi'), a large city and seaport of China, province of Kiangsoo, on the Woosung or Whangpoo, about 12 miles above its entrance into the estuary of the Yantsze-kiang. The Chinese city proper is inclosed within walls 24 feet high, the streets being narrow and dirty, and the buildings low, crowded, and for the most part unimportant. In 1843 Shanghai

was opened as one of the five treaty ports, and an important foreign settlement is now established (with a separate government) outside the city walls. The Chinese authorities retain complete control over all shipping dues, duties on imports and exports, etc. Shanghai has water communication with about a third of China, and its trade since the opening of the port has become very extensive,



the total of exports and imports together, native and foreign, amounting to \$280,000,000 annually. The chief imports are cottons, yarns, woollens, and opium; and the exports, silk, tea, rice, and raw cotton. The largest part of the foreign trade is in the hands of British merchants. The foreign population is about 3000, and the native population is estimated at 300,000.

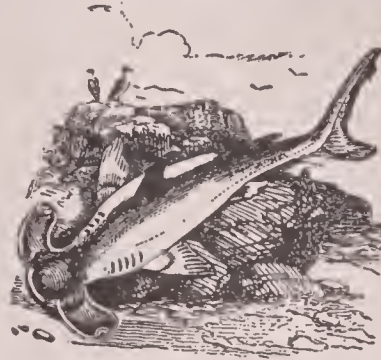
SHANNON, the largest river of Ireland rises at the base of Cuilcagh mountain in County Caven; flows s.w. and s. through loughs Allen, Boderg, Bofin and Derg; divides Connaught from Leinster and Munster; and enters the Atlantic by a wide estuary, at the mouth of which are Loop Head in Clare and Kerry Head in Kerry; length about 250 miles. It is connected with the Royal Canal and the Grand canal, which give a direct communication to Dublin, and also a communication south into the basins of the Barrow and Suir. The tide rises in springs 17 or 18 feet, and in neaps about 14 feet.

SHANSEE', an inland province of Northern China, with an area of 65,950 sq. miles, is the original seat of the Chinese people, and in its lowland parts is well cultivated. The capital is Tac-yuen-foo. Pop. 14,000,000.

SHANGTUNG', a maritime province of China, on the Yellow sea; area, 53,760 sq. miles. It was in this province that Confucius was born. The capital is Tsc-nan-foo, and the pop. 29,000,000.

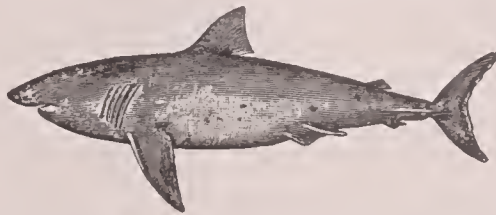
SHARK, the general name for a group of elasmobranchiate fishes, celebrated for the size and voracity of many of the species. The form of the body is elongated and the tail thick and fleshy. The

mouth is large, and armed with several rows of compressed, sharp-edged, and sometimes serrated teeth. The skin is usually very rough, covered with a multitude of little osseous tubercles or placoid scales. They are the most formidable



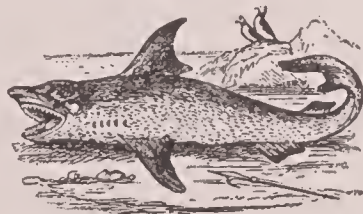
Hammer-headed shark.

able and voracious of all fishes, pursue other marine animals, and seem to care little whether their prey be living or dead. They often follow vessels for the sake of picking up any offal which may be thrown overboard, and man himself



Man-eating shark.

often becomes a victim to their rapacity. The sharks formed the genus *Squalus* of Linnæus, which is now divided into several families, as the *Carcharidæ*, or white sharks; *Lamnidæ*, or basking sharks; *Scymnidæ*, including the Green-



White shark.

land shark; *Scyllidæ*, or dog-fishes, etc. The basking shark is by far the largest species, sometimes attaining the length of 40 feet, but it has none of the ferocity of the others. The white shark is one of the most formidable and voracious of



Bonnet-headed shark.

the species. It is rare on the American coasts, but common in many of the warmer seas, reaching a length of over 30 feet. The hammer-headed

sharks which are chiefly found in tropical seas, are very voracious, and often attack man. They are noteworthy for the remarkable shape of their head which resembles somewhat a double-headed hammer, the eyes being at the extremities. Other forms are the porbeagle, blue shark, fox shark, sea-fox, sea-apie or thresher, and Greenland or northern shark. The shark is oviparous or ovoviviparous, according to circumstances. Large numbers of sharks are caught in some places (Russian Lapland the north of Norway) for the oil contained in their livers.

SHARP, in music, the sign (#) which, when placed on a line or space of the staff at the commencement of a movement, raises all the notes on that line or space or their octaves a semitone in pitch. When, in the course of the movement, it precedes a note, it has the same effect on it or its repetition, but only within the same bar.—Double sharp, a character (X) used in chromatic music, and which raises a note two semitones above its natural pitch.

SHAW, George Bernard, British critic, and dramatist, was born in Dublin in 1856. In 1876 he settled in London and became known as a brilliant writer. His best known works are: *The Irrational Knot*, *Love Among the Artists*, *Cashel Byron's Profession*, and *An Unsocial Socialist*, *Plays Pleasant and Unpleasant*, *Three Plays for Puritans*, and *Mrs. Warren's Profession*. In 1889 he edited *Fabian Essays*, contributing two to the collection, and his writings include many socialistic pamphlets.

SHAW, Henry Wheeler, American humorist, better known as Josh Billings, was born at Lanesborough, Mass., in 1818. His amusing phonetic spelling won great favor in the early sixties. His *Farmers' Almanax*, published annually (1870-80) increased his reputation. He contributed to the *Century* under the pen name "Uncle Esek," and collected his works in 1877. Among American humorists Josh Billings ranks high in pith and point, and is regarded by many as a true moralist. He died in 1885.

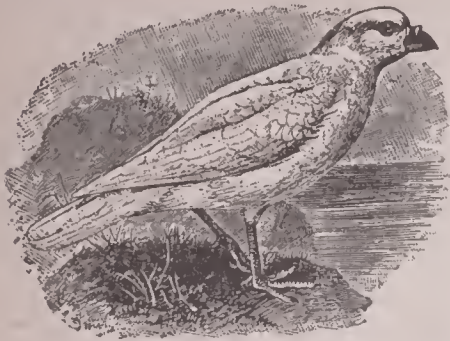
SHAWL, an article of dress usually of a square or oblong shape worn by both sexes in the East, but in the West chiefly by females. Some of the Eastern shawls, as those of Cashmere, are beautiful and costly fabrics. The usual materials in the manufacture of shawls are silk, cotton, hair, or wool. Norwich and Paisley were long famed for their shawls made in imitation of those from India. The shawl was introduced into Europe in the nineteenth century.

SHEAR-TAILS, a genus of humming-birds, of which the slender shear-tail and Cora's shear-tail are two familiar species. These birds occur, the former in Central America generally; the latter in Peru and in the Andes valleys. They derive their name from the elongation of two central tail-feathers of the males.

SHEATH-BILL, a bird belonging to the order *Grallæ*. They derive their name from the horny sheath which overlies the nostrils, and is continued back until it extends in a kind of hood, thickly feathered, covering the face. In appearance and flight they are not unlike pigeons, their plumage being

SHEYBOYGAN

dazzlingly white. They inhabit the islands of the southern oceans, more



Sheathbill.

especially Kerguelen's Island and the Crozets.



Sheartail.

SHEBOY'GAN, a town in Wisconsin, on Lake Michigan, at the mouth of the Sheboygan river. It has a good harbor and a trade in wheat and lumber. Pop. 25,000.

SHEEP, a ruminant animal nearly allied to the goat. It is one of the most useful animals to man, as its wool serves him for clothing, its skin is made into leather, its flesh is an excellent article of food, and its milk, which is thicker than that of cows, is used in some countries to make butter and cheese. The varieties of the domestic sheep are numerous, but it is not known from what wild species they were originally bred, although it is probable that the smaller short-tailed breeds with crescent-shaped horns are descended from the wild species known as the moufflon. The ordinary life of a sheep is from twelve to fifteen years; but it is usually fattened and sent to market at the age of two or three years unless its fleece be the object desired. The latter is shorn every year about the month of May. The chief English varieties of the sheep are the large Leicester, the Cotswold, the Southdown, the Cheviot, and the black-faced breeds. The Leicester comes early to maturity, attains a great size, although the mutton is not of the finest quality, and its fleece weighs from 7 to 8 lbs. The Cotswold breed, which has been improved by crossing with the Leicesters, has fine wool, and a fine grained mutton. The Southdowns are large, their wool is

short, close, and curled, and the mutton is highly valued. The Cheviot is a hardier breed than any of the preceding; its wool is short, thick, and fine, while its mutton is of excellent quality. The black-faced breed is the hardiest of all, its wool is long and coarse, and its mutton is considered the finest. The Merino variety of sheep originally belonged to Spain (where in summer they feed upon the elevated districts of Navarre, Biscay, and Arragon, and winter in the plains of Andalusia, New Castile, and Estremadura), but they are now reared in other parts of the continent, as also in Australia and New Zealand. Their wool is long and fine, but the mutton is of little value. Of the other breeds, which are numerous, mention may be made of the broad-tailed or fat-tailed sheep common in Asia and Egypt, and remarkable for its large tail, which is loaded with fat; the Iceland variety; which has sometimes three, four, or five horns; the fat-rumped sheep of Tartary; the Astrakan or Bucharian sheep, the wool of which is twisted in spiral curls of a fine quality; the Wallachian or Cretan sheep, which has long, large, spiral horns; and the Rocky Mountain sheep, a native of the United States, and notable for its large horns.

SHEEP LAUREL, a small North American shrub. It is a favorite garden shrub, and receives its name from its leaves and shoots being hurtful to cattle.

SHEEPSHEAD, the name of a fish caught on the shores of Connecticut and Long Island. It is allied to the gilt-head



Sheepshead.

and the bream, and is considered a delicious food. It receives its name from the resemblance of its head to that of a sheep.

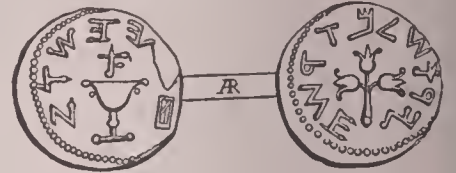
SHEEP TICK, a well-known insect belonging to the family of horse flies. The pupæ produced from the eggs are shining oval bodies which become attached to the wool of the sheep. From these issue the tick, which is horny, bristly, of a rusty ochre color, and wingless. It fixes its head in the skin of the sheep, and extracts the blood, leaving a large round tumor. Called also sheep louse.

SHEFFIELD, a municipal, parl., and county borough of England, county of York (West Riding), situated on hilly ground at the junction of the Sheaf and Don, about 160 miles north of London by rail. The trade of Sheffield is chiefly connected with cutlery, for which it has long been famous, and the manufacture of all forms of steel, iron, and brass work. The steel manufacture includes armor plating, rails, engine castings, rifles, etc. They are also manufactures of engines, machinery, plated goods, Britannia-metal goods, optical instruments, stoves and grates, etc. Pop. 380,717.

SHELL

SHEIK (shēk or shāk), a title of dignity properly belonging to the chiefs of the Arabic tribes, but now largely used among Moslems as a title of respect. The head of the Mohammedan monasteries, and the head man of a village are sometimes called sheiks. The chief mufti at Constantinople is the Sheik-ul-Islam.

SHEK'EL, a Jewish weight and in later times a coin. The weight is believed to have been about 218 or 220 grains troy, and the value of the silver coin sixty cents. There were also half-shekels



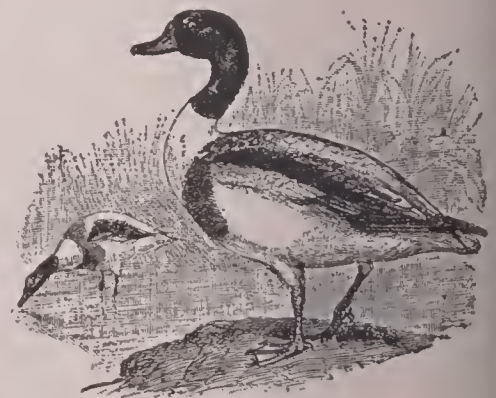
Half-shekel (silver) of Simon Maccabæus.

coined both of silver and copper. A shekel (weight) of gold was worth \$5.00. The shekel of the sanctuary is supposed to have been originally worth double the common shekel.

SHEL'BYVILLE, the county seat of Shelby co., Ind., 26 miles southeast of Indianapolis, on the Blue river, and on the Cleveland, Cincinnati, Chicago and St. Louis and the Pittsburg, Cincinnati, Chicago and St. Louis railroads. Pop. 10,160.

SHEL'DON, Charles Monroe, American clergyman, born at Wellsville, N. Y., in 1857. Among his numerous publications are: *The Crucifixion of Philip Strong, His Brother's Keeper*. In *His Steps*, published in 1896, had a wonderful sale, and aroused much criticism.

SHELDRAKE, or **SHEILDRAKE**, the name given to two species of British ducks, namely, the common sheldrake



Sheldrake.

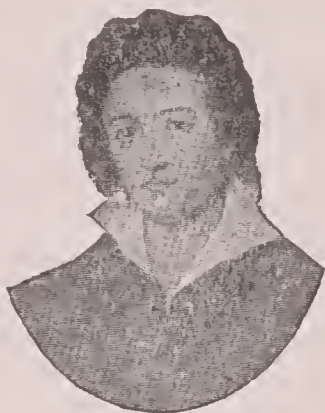
and the ruddy sheldrake. They are sometimes called burrow ducks, from their habit of making their nests in rabbit burrows.

SHELL, the name applied to the external limy covering secreted by various groups of invertebrate animals, but restricted in a scientific sense to that form of exoskeleton secreted by the mantle of the mollusca. Thus the hard coverings of crabs, sea urchins, lobsters, foraminifera, etc., are scientifically known as "tests," and are not to be regarded as true shells. The shell in mollusca grows with the growth of the animal, to which it affords protection.

The shell or test of a crustacean does not grow after it has once been formed, but is cast and renewed from time to time. In its most elementary form the molluscan shell exists as simply a covering to the gills. Each separate piece is termed a valve. So that when the shell consists of one piece, as in whelks, limpets, etc., it is called a univalve; when in two pieces, as in oysters, mussels, etc., it is called a bivalve; and in the Chiton family of gasteropoda it is called, because of its eight pieces, a multivalve. In their chemical composition shells are usually composed of carbonate of lime, mixed with a small proportion of organic matter. Shells are much used in ornamental manufactures.

SHELL, a hollow projectile filled with a bursting charge of gunpowder or other explosive composition, and fitted with a fuse to fire it at the desired point. Shells are usually made of cast-iron or steel, and for mortars or smooth-bore cannon are spherical, but for rifled guns are as a rule elongated. There are many kinds of shells.—Common shells are simple hollow projectiles filled with powder. On explosion they act like a mine. They are very effective in breaching earth-works or masonry.—Palliser shells are made of mottled iron with pointed heads, nearly solid, and chilled white by being cast in iron moulds. They are intended for use against armor-clad vessels; the chilled point, in virtue of its intense hardness

August, 1792. At Oxford, in his second year at the university, he published anonymously, apparently as a challenge to the heads of the colleges, to whom it was sent, a scholastic thesis entitled *A Defense of Atheism*. The authorship being known he was challenged, and refusing either to acknowledge or deny it was at once expelled. After leaving the university he completed his poem of *Queen Mab*, begun some time previously and privately printed in 1813. His first great poem, *Alastor, or the Spirit of Solitude*, saw the light in 1816; and this was followed in 1817 by the *Revolt of*



Shelley.

Islam, a poem in the Spenserian stanza. His principal poems, besides those already mentioned, are *Rosalind and Helen*, and *Julian and Maddala* (the latter a poem recording some of his intercourse with Byron), produced in 1818; *the Cenci* and *the Prometheus Unbound*, in 1819; *the Witch of Atlas*, in 1820; and *the Epipsychidion*, *the Adonais* (an elegy on Keats), and *the Hellas*, in 1821. He was drowned in the Bay of Spezia, Italy, July 8, 1821. Many memoirs of Shelley have appeared the best of which is the *Life* by Prof. Ed. Dowden published in 1886.

SHEM, the eldest son of Noah, and ancestor of Abraham, who was the eighth in descent from him according to the genealogies in the book of Genesis.

SHENANDO'AH, a town in Schuylkill, co., Pennsylvania, 12 miles n. of Pottsville. Founded in 1863, it is the center of a great coal district. Pop. 22,416.

SHENANDOAH, a river of the United States, which flows northeast through the valley of Virginia, and immediately below Harper's ferry joins the Potomac, of which it is the principal tributary. Its length is 170 miles, the greater part of which is navigable for boats. The valley of the Shenandoah was the scene of numerous military operations in the American civil war, and was devastated by General Sheridan in 1864.

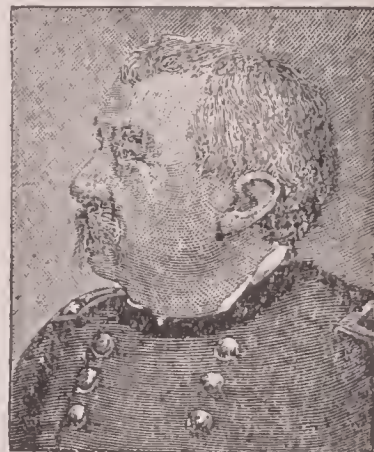
SHEN-SE, a province of China, bounded on the north by the Great Wall, and on the east by the Yellow river; area, 80,900 sq. miles. Pop. 8,276,967.

SHEOL, a Hebrew word frequently occurring in the Old Testament, and rendered in the Septuagint by "hades," in the Authorized Version of "grave," "pit," and "hell," but in the Revised Bible of 1885 never, except in one instance, by the last term. It was, as

originally conceived, the gloomy underworld, the abode of the ghosts or spirits of the dead. No retributive idea was connected with it until the time of the exile.

SHERE ALI KHAN, Amir of Afghanistan, was born about 1823, and succeeded his father, Dost Mohammed, in 1863. Shere Ali in 1879 died, a fugitive, in Afghan Turkistan. He was succeeded by his second son, Yakub Khan, who, however, on account of the Cavagnari massacre, was speedily deposed and deported to India, and was succeeded by his cousin, Abdur Rahman Khan, in 1880.

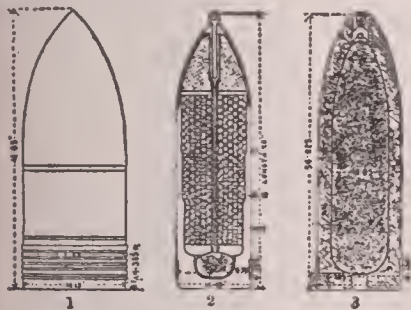
SHERIDAN, Philip Henry, American general, and the greatest cavalry leader produced by the American civil war, was born at Somerset, Ohio, in 1831, graduated at the Military academy, West Point, in 1853, and from 1855 to 1861 served on the frontiers of Texas and Oregon. At the outbreak of the civil war he was a captain in the 13th infantry. Having greatly distinguished himself in the earlier battles of the war, in April, 1864, Grant appointed him chief of cavalry of the Army of the Potomac, and he made several daring cavalry raids into the south. His rush from Winchester to Cedar Creek, a distance of 20 miles, in October, 1864, which turned a federal defeat into a brilliant victory, is known as "Sheridan's Ride." During the final advance upon



Philip H. Sheridan.

Richmond he was Grant's right-hand man; he fought the battle of Five Forks, which necessitated Lee's evacuation of Richmond and Petersburg; and as Lee fled he constantly harassed and attacked him until he compelled his surrender at Appomattox Courthouse, April 9, 1865. After the war he held various military commands. In March, 1869, he became lieutenant-general, and in February, 1884, on the retirement of Sherman, he succeeded to the command of the army. He died August 5, 1888. An account of his military career, written by himself, appeared in 1889.

SHERIDAN, Richard Brinsley Butler, was born at Dublin in 1751, his father being Thomas Sheridan, actor, and latterly teacher of elocution. Without means or a profession he applied himself to composition for the stage, and on 17th January, 1775, brought out *The*



Shells.

1, Armour-piercing steel shell for 111-ton gun. 2, Shrapnel for 111-ton gun. 3, Common shell for 111-ton gun.

and great crushing strength, penetrates to an extraordinary depth. Steel shells of similar power have also been made.—Shrapnel shells are shells filled with bullets, and with a small bursting charge just sufficient to split the shell open and release the bullets at any given point.—Segment shells are of the nature of shrapnel. They contain iron segments built up round the inside of the shell. From their construction they are inclined to spread much more than shrapnel on bursting, and they should consequently be fired to burst close to the object. With percussion fuses great results are produced.

SHELLEY, Mary Wollstonecraft, the second wife of the poet Shelley, was the daughter of William Godwin and Mary Wollstonecraft, and was born in London 1797, died 1851. Her romance of Frankenstein, which excited an immense sensation, was published in 1818, when she was at most twenty-one years old. In 1840-41 she edited Shelley's works, with preface and biographical notes.

SHELLEY, Percy Bysshe, born at Field Place, Horsham, Sussex, 4th

Rivals, which, after a temporary failure, from bad acting, attained a brilliant success. On 21st November, he produced the comic opera, *The Duenna*, which had a run of seventy-five nights an unprecedented success. In 1776 he managed to find money to become one of the proprietors of Drury Lane Theater, where, in 1777, appeared *The School for Scandal*, his most famous comedy, and in 1779 *The Critic*, a farce, which like the *Duenna* and *The School for Scandal* was a model of its kind, and shared in their brilliant success. His dramatic reputation, and especially his social gifts, brought him into intimacy with Fox, Burke, Windham, and other whig leaders, and in 1780 Fox got him returned to parliament for Stafford. In 1782 he became under-secretary of state; in 1783 secretary of the treasury; in 1806 treasurer of the navy and privy-councillor. He never became a statesman, but his fame soon rose high as an orator. His greatest effort was his "Begum" speech on the impeachment of Warren Hastings (1787), which Pitt said "surpassed all the eloquence of ancient and modern times." His wife died in 1792. In 1795 he married Miss Ogle, a daughter of the Dean of Winchester, with whom he received a considerable accession of means. His parliamentary career ended in 1812, and the remainder of his life was constantly harassed by debt and disappointment. He died in 1816, having narrowly escaped arrest for debt on his death-bed.

SHERIFF, in England, the chief officer of the crown in every county, appointed annually. The custody of the county is committed to him by letters-patent, and he has charge of all the business of the crown therein. During his tenure of office he takes precedence within the county of any nobleman, and is entitled to sit on the bench with the justices of assize. The person appointed is bound under a penalty to serve the office, except in specified cases of exemption or disability, but a person who has served one year is not liable to serve again till after an interval of three years if there be another sufficient person in the county. The sheriff is specially intrusted with the execution of the laws and the preservation of the peace and for this purpose he has at his disposal the whole civil force of the county—in old legal phraseology the posse comitatus. The most ordinary of his functions, such as the execution of writs, he universally performs by a deputy called under-sheriff, while he himself only performs in person those duties which are either purely honorary, such as attendance upon the judges on circuit, or which are of some dignity and public importance, such as presiding over elections and holding county meetings, which he may call at any time. The office of sheriff was formerly hereditary in some counties, and continued so in Westmoreland till the death of the last hereditary sheriff the Earl of Thanet, in 1849.

In the United States the sheriff is a very different functionary, not holding the position of a judge at all, but acting as the highest peace officer of his county, having to pursue and arrest criminals, to

carry out sentences, to take charge of the jail, etc.

SHERMAN, a city in Grayson co., Texas, 73 miles n. of Dallas. It is the center of a cotton and grain district. Pop. 12,240.

SHERMAN, JAMES SCHOOL-CRAFT, born in Utica, N. Y., Oct. 24, 1855; graduated from Hamilton College, 1878; admitted to the bar, 1880; president Utica Trust and Deposit company and of the New Hartford Canning company; mayor of Utica, 1884; elected as Republican to 50th, 51st, 53d, 54th, 55th, 56th, 57th 58th, 59th and 60th congresses; nominated for vice president of the United States and elected to that office in November, 1908.

SHERMAN, John, American statesman, was born in 1823, at Lancaster, Ohio. In 1855 he was elected to the thirty-fourth congress in the interest of the Free-Soil party, and was reelected to the thirty-fifth and thirty-sixth congresses. He became a power on the floor and in committees, and was recognized as the foremost man in the house, particularly in matters affecting finance. He was again elected to congress in 1860, but in the following year was chosen to the United States senate, where he at once became a leader. In March, 1877, Senator Sherman was appointed, by President Hayes, secretary of the treasury. It was due to his management while at the head of the treasury, that the resumption of specie payments was effected in 1879 without disturbance to the financial or commercial interests of the country. He was a prominent candidate for the republican presidential nomination in 1880, and again in 1888. In 1897 he resigned from the senate to become secretary of state in the cabinet of President McKinley. He resigned this office shortly after the outbreak of war with Spain in 1898, retired to private life, and prepared his *Forty Years in the House and Senate*. He died in 1900.

SHERMAN, Roger, born in Newton, Mass., April 19, 1721; died in New Haven, Conn., July 23, 1793. When the revolution began he sided with the patriots, and in August, 1774, was chosen as delegate to the continental congress. Later, with Adams, Franklin, Jefferson, and Livingston, he was one of the committee who drew up the declaration of Independence. From 1784 until his death he was mayor of New Haven, and in 1791 was United States senator for Connecticut.

SHERMAN, William Tecumseh, American general, was born at Lancaster, Ohio, 1820, graduated at the military academy, West Point, in 1840, and served in Florida, Mexico, and elsewhere till 1852, when he resigned his commission. On the breaking out of the civil war he offered his services to the United States government, and was appointed colonel of the 13th regiment of infantry. He was present at the battle of Bull Run, greatly distinguished himself at Shiloh, and subsequently took a prominent part in the operations under Grant around Vicksburg and Memphis. In March, 1864, he succeeded Grant as commander of the military division of the Mississippi, and at the beginning of May, simultaneously with Grant's ad-

vance in the east, he entered upon his invasion of Georgia. On September 2, after a number of battles, he received the capitulation of Atlanta, and on December 21, of Savannah; and then turning northward into the Carolinas and fighting more battles, he received the surrender of General J. E. Johnston, at Durham station, April 26, 1865, a



William Tecumseh Sherman.

surrender which brought the war to a close. Sherman was made a major-general in August, 1864, lieutenant-general in July, 1866, and general and commander-in-chief in March, 1869. He was retired in 1884. His military career is detailed in his *Memoirs*, written by himself, and published in 1875. He died in 1891.

SHERRY, a Spanish wine made in the neighborhood of Xeres de la Frontera, in the province of Andalusia, near Cadiz. The soil of the best vineyards consists chiefly of carbonate of lime, with a small admixture of silex and clay, and occasionally magnesia. The dry sherry is the most esteemed, the finest variety being the Amontillado sherry. The sherry wines are shipped for the most part at Cadiz, and are principally exported to England. No wine is more largely imitated and adulterated than sherry.

SHETLAND, or ZETLAND, an insular county of Scotland, about 50 miles n.e. of Orkney; area, 352,876 acres. It consists of about ninety islands and islets, of which twenty-nine are inhabited, the largest being the following: Mainland, Yell, Unst, Whalsey, Fetlar, and Bressay, the first occupying about three-fourths of the whole area of the group. The Shetland pony is well known, and is not surpassed by any horse of its dimensions for strength and hardihood. The fisheries, especially the herring-fishery, are very valuable, and afford the chief employment. The knitting of woolen articles may be said to be the only native manufacture. For parliamentary purposes Shetland unites with Orkney in returning one member. The only town is Lerwick. Pop. 26,185.

SHIB'OLETH, a word which was made by Jephthah the criterion to distinguish the Ephraimites from the Gileadites at the fords of Jordan.

SHIELD, a piece of defensive armor,



TYPE OF THE MODERN FLOATING CITY.

The illustration strikingly exhibits the enormous size of the Mauretania and Lusitania of the Cunard Company and the vast internal organization in which is compressed the principal conveniences of modern life ashore. The drawing explains itself but it should be borne in mind that the grand saloon is not really interrupted by funnels although the necessities of a sectional plan give that impression. The boilers, too, are three deep, side by side, and the coal bunkers extend right along them fore and aft on the port and starboard. The coal is fed to the furnaces by trap-doors opening into the bunkers. The view in the background is of New York City, and being drawn on the same scale as the ship gives an excellent idea of the length of these huge leviathans of the sea.

borne on the left arm. Shields gradually disappeared with the introduction of firearms, but the target and broadsword were the favorite arms of the Scotch Highlanders up to the middle of the 18th century.

SHIELD, in heraldry, the escutcheon or field on which are placed the bearings in coats of arms. The shape of the shield upon which heraldic bearings are displayed is left a good deal to fancy; the form of the lozenge, however, is used only by single ladies and widows. The shield used in funeral processions is of a square form, and divided per pale, the one half being sable, or the whole black, as the case may be, with a scroll border around, and in the center the arms of the deceased upon a shield of the usual form.

SHIELDS, South, a municipal, parl., and county borough of England, in the county of Durham, near the mouth of the Tyne, opposite to North Shields, and communicating with it by steam-ferry. The industries comprise glass earthenware, alkali and chemicals, cordage, steam-engine boilers, and chain-cables and anchors, besides ship-building. Pop. 97,267.

SHIITES (shi'itiz), one of the two great sects of Mohammedans, who do not acknowledge the Sunna as a law, and believe that Ali, the fourth caliph after Mohammed, was his first lawful successor. The Persians are Shiites. See Sunnites.

SHIKARPUR, chief town of Shikarpur District, Sind Province, Bombay presidency, India, 18 miles west of the Indus and 26 southeast of Jacobabad. It is an emporium for transit trade between the Bolan Pass and Karachi, but has lost much of its commercial importance since the opening of the Indus Valley railway. The principal manufactures are carpets and coarse cotton cloth. Pop. 50,000.

SHILLING, an English silver coin, equal in value to 12 bronze pence or one-twentieth of a pound sterling, and approximate in value to 24 American cents, to 1.25 French francs, and to 1.11 German marks.

SHILOH, Battle of, one of the most memorable battles of the American civil war. Shiloh is in Tennessee, 2 miles west of Pittsburg Landing, on the Tennessee river, and took its name from a log chapel known as "Shiloh church." The battle was fought on the 6th and 7th of April, 1862, Grant and Sherman leading the federals, and A. S. Johnson and Beauregard the confederates. The first day the confederates, taking the federals by surprise, drove them from their lines, with heavy loss in men and guns; but the second day the federals, having received reinforcements, and largely outnumbering the confederates, regained their lines, and forced the confederates to retreat to their former position at Corinth.

SHINGLE, a thin piece of wood resembling a roofing slate, and used for the same purpose and in the same way. In Canada and the United States, and other places where timber is plentiful, shingles are extensively used for a roof-covering. They are usually cut by ingenious machinery devised for the special purpose.

SHINGLES, an eruptive skin disease,

which usually starts from the backbone and goes half way round the body, forming a belt of inflamed patches, with clustered vesicles. It rarely encircles the body, though the popular opinion that if it does it will prove fatal is a delusion. It is sometimes produced by sudden exposure to cold after violent exercise, and sometimes follows acute affections of the respiratory organs. It seems to depend upon abnormal nervous action, as it frequently marks out upon the surface the part of the integument supplied by some one branch of a nerve. It is usually attended with more or less neuralgic pain and fever. It is a self-limited or cyclical disease, usually running its course in about a fortnight.

SHINTO'ISM, one of the two great religions of Japan. In its origin it was a form of nature worship, but the essence of the religion is now ancestor worship and sacrifice to departed heroes.

SHIP, in the most general sense, a vessel intended for navigating the ocean. In contradistinction to boat, which is the most general term for a navigable vessel, it signifies a vessel intended for distant voyages. Ships are of various sizes, and fitted for various uses, and receive various names, according to their rig and the purpose to which they are applied, as man-of-war ships, transports, merchantmen, barques, brigs, schooners, luggers, sloops, xebecs, galleys, etc.

The ancient art of ship-building, like many other arts, was lost in the overwhelming tide of barbarism which overthrew the last of the great empires of antiquity. The ruder nations of Europe had to begin again in great measure on their own resources. The war galley of the ancients may possibly be so far preserved in the mediæval galleys applied to the same purpose. On the Mediterranean, too, an unbroken line of coasting ships may probably have continued to sail. But it appears evident that the progress made in ship-building under the Roman Empire, not to speak of the Phœnicians and other earlier navigators, was much greater than was transmitted to mediæval Europe. Ship-building made little progress in Europe till the discovery of the compass, which was introduced in a rude form in the 12th century, and had been improved and had come into common use in the 14th century. The opening up of the passage to India and the discovery of America made another epoch in its progress. In the building of large vessels the Spaniards long took the lead, and were followed by the French, who especially distinguished themselves in the theoretical study of the art. In the early progress of the art of ship-building the English took little or no part. When Henry VII. built the *Henry Grace de Dieu*, which is regarded as the parent of the British navy, the English were greatly inferior to the nations of Southern Europe both in navigation and in ship-building. In the reign of Elizabeth the English fleet proved its superiority to that of Spain in respect of fighting capacity, but it was afterward rivaled by that of Holland. Rapid improvement was made in ship-building during the 17th and 18th centuries in England as well as the maritime

states of the Continent. The first three-decker was built in England in 1637. She was called the *Sovereign of the Seas*, and was deemed the best man-of-war in the world. In 1768 the French adopted three-deckers; and from their application of science they acquired a decided superiority in the size and models of their ships over the English. In the early part of the present century the lead in improvement was taken by the United States. English builders were at first skeptical as to American improvements; but in 1832 Scott Russell theoretically established the principles on which speed in sailing depends—principles which had already been practically applied not only by the Americans but by the Spaniards. From the time of their theoretical establishment they were rapidly adopted in England, and a race of improvement began between Great Britain and America. The true principles of construction both in build and rig were exemplified in the celebrated Baltimore clipper schooners, which were sharp in the bow, deep in the stern, of great length, and lying low in the water, with long, slender masts, and large sails cut with great skill. The same principles were afterward applied to square-rigged vessels, and produced the English and American clipper ships which did so much to develop the trade of India, China, and Australia with both Europe and America.

A great change came over the art of ship-building when steam was introduced and wood gave place to iron and then to steel. The first steamer built expressly for regular voyages between Europe and America was the *Great Western*, launched in 1837. She was propelled by paddles, but about the same time Ericsson invented his screw-propeller, which was soon adopted in sea-going ships, and the British Admiralty possessed a screw vessel in 1842. Iron vessels were built early in the 19th century for canal service, then for river service, and later for packet service on the coasts. About 1838 iron vessels were built for ocean service, but the first ocean-going steamship in its present form, built of iron and propelled by the screw, was the *Great Britain*, launched in 1842. Compound engines were first introduced with high-pressure steam in 1854. The progress of steam navigation is marked by special types of vessels built from time to time. Many of the vessels belonging to the great ocean lines are splendid specimens of naval architecture, some of them being nearly 800 feet in length, having a displacement of 30,000 or 40,000 tons or even more, and with engines working up to 30,000 or 40,000 horse-power, and making the trip from Queenstown to New York in less than five days. The largest vessels are all propelled by steam, but very large sailing vessels are now constructed also, especially since it became not uncommon to fit them with four, and even five, masts.

An iron vessel is lighter than a wooden one of the same size, and with iron the same strength may be obtained with less weight. Iron is also far more manageable than wood, as it can be

SHIP CANAL

bent with ease into any required shape. Steel, which is now superseding iron for building ships, is a still lighter material and is equally manageable. See Sail and Steamship.

SHIP CANAL, a canal for the passage of sea-going vessels. Ship canals are intended either to make an inland, or comparatively inland place, a seaport, or to connect sea with sea, and thus obviate a long ocean navigation. Of the former kind are the Manchester Ship Canal, making that city a seaport, and the Amsterdam Canal, which gives Amsterdam a direct passage to the North Sea at Ymuiden. Of the latter kind are the Suez Canal, the Caledonian Canal, the North Sea and Baltic Canal, and (not yet completed) the Panama Canal, Nicaragua Canal, etc. The Caledonian Canal was formed by the British government for military purposes. It is a good example of a ship canal which traverses high districts and surmounts the elevation by locks. The Suez Canal (1860-69) is the greatest of all ship canals yet complete. It has no locks whatever, and communicates freely with the sea, connecting the Mediterranean with the Red Sea, 88 miles, and reducing the length of the voyage from London to India from 11,379 to 7628 miles. The Panama Canal, designed to connect the Atlantic Ocean with the Pacific, will be the greatest engineering work of the kind the world has ever seen.

SHIPKA PASS, a pass in the Balkans, about 4600 feet above the sea, the scene of a desperate and bloody ten days' struggle during the Russo-Turkish war (August and Sept. 1877). In his futile endeavors to take Fort Nicholas at the summit of the pass from the Russians, Suleiman Pasha lost 20,000 of his best men.

SHIP RAILWAY, a railway composed of several tracks, with some sort of carriage for transporting vessels from one body of water to another. Captain J. B. Eads's proposed plan for the Tehuantepec Ship Railway, across the isthmus between North and South America in Mexican territory, consists essentially of a series of some eight or ten tracks, having a carrying car or cradle of some five sections, with altogether 1000 wheels. Calculated for a vessel of 10,000 tons, this would not give a pressure so great as that of an ordinary locomotive. A ship railway has been constructed by the Canadian government between Chignecto Bay, in the Bay of Fundy across the isthmus to Northumberland Straits, a distance of 17 miles, which enables vessels to go from Prince Edward Island to St. John, New Brunswick, in twelve hours, and greatly facilitates the transport of grain in bulk from the lake ports to New Brunswick. The vessels are raised by hydraulic pressure a height of 40 feet to the level of the railway, and placed on a double track 18 feet from center to center. The flexible car system of ship railway invented by William Smith, harbor engineer of Aberdeen, is designed to allow of the use of ordinary railway gradients. The car is in sections, each carried on a compound bogie running on parallel lines. Vertical and lateral

flexibility are secured, and the ship is sustained on the car by water-cushions, so that it is virtually kept floating. The ship is raised on to the cars by means of a submerged shipway inclosed within a wet dock.

very thin film alone of wood is left between the cavities, which are lined with calcareous incrustation. Various plans are tried to protect ships, piers, etc. from this destructive animal, such as copper-sheathing, treating with creosote



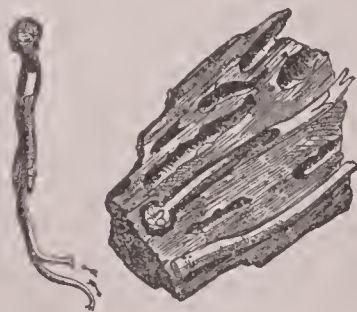
Ship railway.

SHIP-WORM, the popular name of a lamellibranchiate mollusk belonging to the Pholadidæ or pholas family, and distinguished by the elongation of the respiratory "siphons" or breathing-tubes conveying water to the gills, which give to this mollusk a somewhat vermiform or wormlike aspect. The two valves or halves of the shell are of small size and globular shape, and are situated at its anterior extremity, the valves

etc.; but the plan which appears to have been most successful in arresting ravages is that of driving a number of short nails with large heads into exposed timber. The rust from the heads of the nails appears to prevent operation. A large species of terebrantia occurs in warm latitudes, where it bores into the hardened mud or sand of the sea-bed, as well as into timber.

SHITTIM-WOOD, of which the tabernacle in the wilderness was principally constructed, was the wood of the shittah tree of the Bible, which is supposed to be the Acacia seyal of the Sinaitic peninsula. (See Acacia.) It is a light-colored, cross-grained and enduring wood, of a fine orange-brown color.

SHOCK, in medicine, a sudden depression of the system produced by violent injuries or violent emotions. It is especially a sudden term. The vital phenomena of the system—consciousness, respiration, heat, circulation—are depressed in proportion to the shock received by the nerve-centers. In the case of collapse consequent upon a shock, the patient lies completely prostrate, face pale and bloodless, the skin cold and clammy, and the features contracted and expressive of great languor. There is also extreme muscular debility, the pulse is frequently, so weak as to be scarcely perceptible. Incoherent drowsiness, or complete insensibility, is often manifested on the part of the patient. Shock results either in a

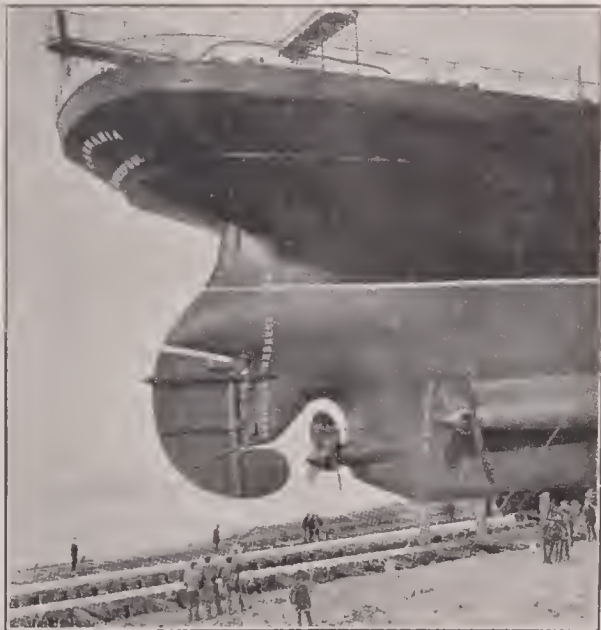


Ship-worm, and piece of wood perforated by teredos.

being three-lobed. In length the shipworm averages about a foot, and in thickness about $\frac{1}{2}$ inch. It has gained great notoriety from its boring habits, occasioning great destruction to ships and submerged wood by perforating them in all directions in order to establish a habitation. In boring into the wood (the shell is the boring instrument) each individual is careful to avoid the tube formed by its neighbor, and often a



Turbine steamer of 20,000 tons gross, showing comparison with sailing ship.



Propellers and rudder and hull of ship before launching.

plete suspension of the action of heart, causing death, or passes into reaction; and the treatment of shock is to be directed to the immediate development of reaction. In mild cases external warmth, a little stimulant, and rest are all that is required; but in the severer forms a more liberal recourse to heat and stimulants is absolutely necessary, and should be continued until indications of commencing reaction appear. The heat should be applied to the pit of the stomach and the extremities by means of hot flannel, hot-water tins, or like appliances. The stimulant most recommended is brandy in hot water, and this should be followed by nourishment, such as beef-tea.

SHODDY, the fibrous substance composed of woolen rags torn fine in a machine called a "devil," and converted into cheap cloth by being mixed and spun with a certain proportion of fresh wool.

SHOES, coverings for the feet, generally made of leather in Europe and America, but in Holland and France often of wood, and in China and Japan of paper and other fabrics. The shoe is a combination of the sandal of the oriental races and the moccasin of untanned hides of savage races—sole without upper and upper without sole. The first allusion to a shoe in the Old Testament is where Abraham refuses to take so much as a "shoe-latchet" from the King of Sodom. For "shoe" in this instance we are probably to understand "sandal;" but shoes proper, as well as sandals, seem to have been used among the Jews; for on the black obelisk from Nimroud Jews are represented as wearing shoes or boots with turned-up toes, similar to those worn by orientals in the present day. The Romans used various kinds of shoes, such as the solea or sandal; the calceus, which covered [the whole foot, somewhat like our shoes, and was tied with a latchet or lace; and the caliga, a very strong kind of shoe, sometimes shod with nails, worn by the soldiers, who were thence called caligati. Both in ancient and in modern times the fashion of shoes has varied much, just as in other articles of dress. In the reigns of Henry I. and Stephen, shoes were made for the fashionable with long points stuffed with tow, and made to curl in the form of a ram's horn; and in the reign of Richard II. the points had increased to such an extent that they reached the knee, to which they were secured by chains of silver or gold. In the 18th century, among the ladies, absurdly high-heeled shoes were the rage, a fashion which has been revived within the last few years. The present simple form of shoe was adopted in the early part of the 17th century, and somewhat later the shoe buckle came into use. In the early part of the 19th century buckles appear to have become unfashionable, their place being supplied by the simpler and less costly shoe-strings. To the same period belongs another improvement—that of making shoes right and left. Boots are a variety of shoe with the upper leathers lengthened so as to protect part of the leg. Till recently the making of boots and shoes was a purely manual handicraft;

now, with the exception of the finest and best finished qualities, the manufacture is done almost entirely by machinery.

SHOLAPUR', chief town of Sholapur district, Bombay presidency, India, 150 miles by rail from Poona. Its situation between Poona and Haiderabad has made it, especially since the opening of the railway in 1859, the center for the trade of a large extent of country. Its chief industry is the manufacture of silk and cotton cloth. Pop. (including cantonment), 75,288.—The district of Sholapur has an area of 4521 sq. miles, and pop. 720,978.

SHOOTING-STAR, a meteor in a state of incandescence, caused by the resistance of the atmosphere, seen suddenly darting along some part of the sky. See Aerolite and Meteor.

SHORTHAND, the method of writing by which the process is so abbreviated as to keep pace with speech. It is also known, according to the principle underlying the particular system, as tachygraphy (quick writing), brachygraphy (short writing), stenography (compressed writing), and phonography (sound writing). It was practiced by the ancient Greeks and Romans, not only on account of its brevity but for purposes of secrecy; but all knowledge of the art was lost from the 10th century until the end of the 16th, when modern shorthand had its birth in the publication by Dr. Timothy Bright of his *Characterie* (1587), and by Peter Bales of his *Arte of Brachygraphie* (1590). In these early systems arbitrary signs were used in most cases to denote each word. The earliest system of shorthand of any practical importance was that of John Willis, whose *Arte of Stenographie* (1602) became very popular. It was based on the common alphabet, with the addition of arbitrary signs; and this, indeed, was the character of the numerous systems which obtained until the time of Pitman (1837).

Pitman had a number of predecessors, whose systems, like his own, were strictly phonetic. These systems, however, never obtained any footing, while Pitman's almost immediately became popular, and is now used by a larger number of reporters and shorthand writers than any other. Like all other phonetic systems, Pitman's rejects the ordinary orthography, and writes words according to their sounds; thus, though becomes tho, plough becomes plow, and enough becomes enuf. Discarding the common alphabet, which formed the basis of the stenographic systems, it has adopted an alphabet of its own, consisting of a series of straight lines, curves, dots, etc., each representing a distinct sound. This alphabet is the basis of a highly ingenious and complex system, which aims at securing the greatest degree of brevity consistent with legibility. This end it endeavors to attain by a variety of devices, forming integral parts of the system. In rapid writing on Pitman's system the vowels are generally omitted.

SHORTHORNS, a breed of cattle externally distinguished by the shortness of their horns, which originated in the beginning of the 19th century in the val-

ley of the Tees, and under the name of Durhams, Teeswaters, or Shorthorns, soon spread over all the richly pastured districts of Britain. They are excellent for grazing purposes, being of rapid and large growth with aptness to fatten, but are inferior to some other breeds for dairy purposes.

SHOSHONE FALLS (sho-shō'nē), on Lewis or Snake river, in the state of Idaho, United States. They rank among the waterfalls of North America next to those of Niagara in grandeur, being about 300 yards wide and 200 feet high.

SHOSHONES (sho-shō'nēz), or **SNAKES**, a tribe of North American Indians inhabiting a considerable stretch of territory in Idaho, Utah, Nevada, etc. They live partly by hunting and fishing, many of them also on roots and small animals. They number about 5000.

SHOT, a term applied to all solid projectiles fired from cannon, and also to hollow projectiles without bursting charges, as the Palliser shot. Solid shot have gradually disappeared since the introduction of rifled guns, which fire elongated shot with more or less conical heads. Some of the shot fired by the immense guns now used weigh not far short of a ton. Smooth-bored ordnance still use solid round shot and case-shot. Case-shot consists of iron balls packed in iron or tin cylindrical cases. Grape differs only in the balls being larger. Shot is also the name given to the small round pellets of lead used with sporting guns for shooting small quadrupeds and birds. This kind of shot is made by dropping the melted lead through the holes of a colander set at a considerable height above water, the drops naturally assuming the globular form.

SHOULDER-JOINT, the articulation of the upper arm or humerus with the ploid cavity of the scapula or shoulder-blade. The shoulder-joint forms an example of the ball-and-socket joints, the ball-like or rounded head of the humerus working in the shallow cup of the glenoid cavity. Such a form of joint necessarily allows of very considerable movement, while the joint itself is guarded against dislocation or displacement by the strong ligaments surrounding it, as well as by the tendons of its investing and other muscles. The muscles are the supraspinatus above, the long head of the triceps below, the subscapularis internally, the infraspinatus and teres minor externally, and the long tendon of the biceps within. The deltoid muscle lies on the external aspect of the joint, and covers it on its outer side in front, and behind as well, being the most important of the muscles connected with it. The movements of the shoulder-joint consist in those of abduction, adduction, circumduction, rotation—a "universal" movement being thus permitted; and its free motion is further aided, when the bony surfaces are in contact, by separate movements of the scapula itself, and by the motions of the articulations between the sternum and clavicle, and between the coracoid process and clavicle also. The biceps muscle, from its connection with both elbow and shoulder joints, brings the

movements of both into harmonious relation. The shoulder-joint is liable to various diseases and injuries. Local injury may result in inflammation of the joint, while special diatheses or diseased conditions of constitutional origin may each give rise, either per se or through injuries, to such lesions as strumous or scrofulous disease of the joint, to syphilitic lesions, and to gouty or rheumatic attacks. Of the accidents to which the joint is liable dislocations are by far the most frequent.

SHOVEL-FISH, a genus of fishes belonging to the sturgeon family, and found in North American rivers. It is so named from the flattened form of the head.

SHOVELLER-DUCK, a genus of ducks, distinguished by its long bill, of which the tip is hooked and broadened. The average length of this bird is about 18 or 20 inches. In the male the colors are rather gay and varied—green, white, brown, pale, blue, and black. The coloring of the female is more somber. The shoveller-duck is found in Britain during the winter months.

SHOWBREAD, in the Bible, the twelve loaves of bread, representing the twelve tribes of Israel, which were exhibited before the Lord on the golden table in the sanctuary. They were made of fine flour unleavened, were changed every Sabbath, and were eaten by the priests only.

SHRAPNEL, Lieutenant-general Henry, entered the Royal Artillery in 1779, served with the Duke of York's army in Flanders, and shortly after the siege of Dunkirk invented the case-shot known by the name of shrapnel-shells, an invention for which he received from government a pension of \$6000 a year in addition to his pay in the army. He retired from active service in 1825, attained the rank of lieutenant-general in 1827, and died in 1842.

SHREVEPORT, a city in the state of Louisiana, on the Red river, 327 miles by rail n.w. of New Orleans, with which it has regular steamboat communications. It is situated in a splendid cotton-growing region, and is one of the principal cotton-markets in the southwest of the United States. Its industries are varied. Pop. 19,161.

SHREW, or **SHREW-MOUSE**, a genus of mammals belonging to the order Insectivora, and to be carefully distinguished from the ordinary and common mice which are included in the order Rodentia; and from the dormice, also belonging to the Rodent order. The shrews form the family Soricidæ, and the genus *Sorex* includes the typical members, namely, the common shrew, the lesser shrew, and the water shrew. The common shrew averages about 4 inches in length, the square tail making up half of this measurement. It may readily be distinguished by its prolonged muzzle, by the teeth being colored brown at the tips, and by the reddish-brown fur. It feeds upon insects and their larvæ, and inhabits dry places, making a nest of leaves and grasses. Its habits are chiefly nocturnal. Shrews are very voracious in their habits, and frequently kill and devour one another. They secrete a fluid of disagreeable odor

in special glands, and this odor prevents larger animals from eating their flesh. In former days the bite of the shrew was accounted venomous, while its body, variously treated, was regarded as a cure for many complaints. The lesser shrew closely resembles the common shrew in external form, differing from it chiefly in point of size. The water shrew attains a total length of from 4½ to 5 inches. The snout is not so



Common European shrew.

pointed as that of the common shrew. The ears are very small. The color is black on the upper and white on the under parts. A prominent swimming fringe of stiff white hair is found on the tail and on the toes, and forms a distinctive feature of the species. Its food resembles that of the common shrew, but aquatic larvæ appear to form a large part of its nutriment. It makes its bur-



American water-shrew.

rows in the overhanging banks of rivers and lakes, and dives and swims with great facility. The red-toothed shrews characteristic of the North American continent belong to the allied genus *Blarina*, distinguished from *Sorex* by the dentition and the remarkable shortness of the tail; but there are also a number of North American shrews belonging to the genus *Sorex*.

SHRIKE, a general name applied to the members of a family of birds. The family is conveniently divided into two groups, the true shrikes, and the bush-shrikes. The former is distinguished by



Great gray shrike.

the broad base of the bill, which is hooked at the tip. The nostrils, which are situated laterally, are surrounded by bristles. The fourth quill is longest in the wings, and the tail is of graduated or

conical shape. The name of drongos or drongo-shrikes has been given to certain birds allied to the shrikes, and forming the family *Dicrurinae*. The forked-tailed crested shrike, a bird inhabiting India, about 10 inches in length, is an example of these.

SHRIMP, the name applied to many small crustaceans, and especially to the common shrimp, which belongs to the ten-footed crustacea and to the suborder *Macroura* (long-tailed). The common shrimp reaches a size of about 2½ inches, inhabits the sand of many parts of coasts and is caught for the market by means of a bagnet placed transversely on a pole, which is pushed through the sand at a depth of about 1½ or 2 feet. When alive it is of a light brown or almost white color, resembling that of the sand in which it lives, but after boiling it assumes the well-known brown-color. It is common on the east and west coasts of North America as well as those of Britain. The red shrimp inhabits deeper water than the common shrimp, and is not nearly so abundant. It reaches a size of from 2 to 2½ inches. When alive it is of a reddish-gray, with spots of deeper red; after boiling it is of a uniform deep red. This species is sometimes confounded with the common prawn; but it never reaches the size of the prawn, which, when adult, is above 4 inches in length.

SHRINE, originally a reliquary, or some kind of receptacle, for holding the bones or other relics of saints. Sometimes shrines were merely small boxes with raised tops like roofs; sometimes actual models of churches; sometimes the tombs or mausoleums of saints—



Portable shrine, Malmesbury abbey.

large constructions, like that of Edward the Confessor at Westminster. Many were (and are) ornamented with gold, precious stones, or inlaid work; and among Roman Catholics some shrines are still objects of pilgrimage.

SHROPSHIRE, or **SALOP**, an inland county of England, bounded by Cheshire, the detached part of Flintshire, Denbighshire, Montgomeryshire, Radnorshire, Herefordshire, Worcestershire, and Staffordshire. Area, 841,167 acres, of which about seven-eighths are under crop. Pop. 239,321.

SHROUDS, a range of large ropes extended from the heads of the lower masts to both sides of a ship to support the masts, and named, from the masts to which they belong, the main, fore, and mizzen shrouds. Topmast, topgallant, and bowsprit shrouds are all similar to their object.

SHROVE-TUESDAY, the day before the first day of Lent or Ash-Wednesday.

so called as a day on which confession was specially made and "shrift" received. (See Carnival and Lent.) It was a day of considerable festivity, and from the common practice of eating pancakes then the day came to be called Pancake Tuesday.

SHRUBS, plants in which the perennial portion forms the greater part, which branch near the base, which are taller than bushes but not so tall as trees, seldom exceeding the height of a man. For practical purposes shrubs are divided into the deciduous and evergreen kinds. Among ornamental shrubs the best known are those belonging to the genera *Rosa*, *Ribes*, *Rhododendron*, *Azalea*, etc. Among evergreen shrubs are the box, the laurel, and various heaths.

SIAM, a kingdom embracing a great part of the Indo-Chinese Peninsula and part of the Malay peninsula, and lying between Burmah on the west, and Anam and Cambodia on the east and southeast. Its chief natural boundaries are the Mekong and the sea. Its area is estimated at about 200,000 sq. miles, and its population at 6,000,000, including 2,000,000 Siamese, 2,000,000 Laotians, 1,000,000 Chinese, and 1,000,000 Malays. The minerals include gold, tin, iron, copper, lead, zinc, and antimony, besides several precious stones, such as the sapphire, oriental ruby, and oriental topaz. During the dry season, which lasts from November to May, there is an utter absence of rain in this region, which again is so flooded by rain during the wet season as to be converted into a vast swampy forest. Cocoa and areca palms are numerous in Siam; fruits are abundant and of excellent quality; black pepper, tobacco, cardamoms, and gamboge are important products. The forests produce aloes-wood, sappanwood, teak-timber, bamboos, rattans, gutta-percha, dammar, catechu, benzoin, etc. Among wild animals are the tiger, leopard, bear, otter, orang-outang, single-horned rhinoceros, and elephant, which here attains a size and beauty elsewhere unknown. The last, when of a white color, is held in the highest reverence. The forests abound with peacocks, pheasants, and pigeons; and in the islands are large flocks of the swallows that produce the famed edible birds'-nests. Crocodiles, geckoes, and other kinds of lizards, tortoises, and green-turtles, are numerous. The python serpent attains an immense size, and there are many species of snakes.

The chief export is rice, after which come teak, pepper, dried fish, birds'-nests, cattle, and teel seed. The chief imports are gold-leaf and treasure, and cottons, after which come opium, china goods, gunny bags, hardware, kerosene-oil, and silk goods. The chief direct exports are teak-wood and rice. Telegraph lines connect Bangkok with Tavoy in Lower Burmah, with Pnompenh in Cambodia, and with Cheingmai, the chief city of North Siam, and others are being constructed. There is a postal service at Bangkok, and in 1885 Siam joined the International Postal Union. A railway from Bangkok inland is being made.

The Siamese are members of the great Mongolian family, and of the same race

as the people of Burmah and Anam. In stature they do not average more than 5 feet 3 inches in height; they have a lighter-colored skin than the western Asiatics, but darker than the Chinese. The Siamese profess Buddhism, introduced into the country about the middle of the 7th century. Christianity is now making some progress in the country. The language of the chief Buddhist works is Pali. The printing-press has been introduced in recent years, and many of the best Siamese works can now be had in a printed form.

The legislative power is exercised by the king in conjunction with a council of ministers. There is a small standing army, officered to some extent by Europeans, and a general armament of the people, in the form of a militia. The navy consists of 4 steam corvettes, mostly officered by Europeans, chiefly Englishmen. There are 41 provinces, each administered by a governor.

Siam appears to have no place in history prior to A.D. 638, and the credible records go back only to 1350, the date of the foundation of Ayuthia, the old capital.

SIAMANG, one of the higher anthropoid or manlike apes. This animal, the largest and one of the best known of the



Siamang.

gibbons, inhabits Sumatra. It averages about 3 feet in height in its adult state, has very long arms, and leads an essentially arboreal life.

SIAMESE TWINS, the best-known example of two male individuals having their bodies connected inseparably from their birth, being joined by a thick fleshy ligament from the lower end of the breast-bone of each, having the common navel on its lower border, so that they stood in a sort of oblique position toward each other. Born in Siam in 1811, of a Chinese father and a Chino-Siamese mother, and named Eng ("right") and Chang ("left"), they were brought to the United States in 1829. They were on exhibition in Europe and America a number of times, and ultimately settled in the state of Pennsylvania. They married two sisters and had large families of children, none of whom exhibited any malformation. Chang received a paralytic stroke in 1870, and three years later was affected with an inflammatory disease of the respiratory organs. He died unexpectedly (January 17, 1874) while his brother

was asleep, and Eng died a few hours afterward. The Siamese twins attracted great attention during their lifetime, particularly from physiologists and medical men, some of whom thought that the ligament connecting them might have been cut without causing the death of either.

SIBERIA, a great division of the Russian dominions. It occupies all North Asia, stretching uninterruptedly eastward from the Ural mountains to the Pacific Ocean, and southward from the Arctic ocean to the Chinese dominions and Russian Central Asia. It has a total area of 4,824,570 sq. miles., with a population of fully 5,000,000, and is divided into the governments of Tobolsk and Tomsk, the governor-generalship of Irkutsk, including the governments of Irkutsk and Yeniseisk, and the province of Yakutsk; and the governor-generalship of the Amur, including the province of the Amur, the province of Transbaikalia, the provinces of the Coast and the Anadir, and the island of Saghalin. The division into Western Siberia, Eastern Siberia, and the Amur regions was familiar for a number of years, but is no longer official. A region of such vast extent has naturally a very diversified configuration; but generally speaking Siberia may be considered as a vast inclined plane sloping gradually from the Altai, Sayan, and Yablonoi mountains on the south to the Arctic ocean on the north. In the east it is traversed in different directions by several mountain ranges, but elsewhere it is almost unbroken by any greater heights than a few hills. It is drained chiefly by the Obi (2120 miles), with its great tributary the Irtysh (2520 miles), the Yenisei, and the Lena (3000 miles), all of which pursue a northerly course to the Arctic ocean; and by the Amur (2700 miles, 2400 of which are navigable), which flows in an easterly and northeasterly direction to the Pacific. The principal lake is Lake Baikal in the south, 400 miles long, 20 to 53 broad, and 1560 feet above sea-level. The chief islands are the New Siberia group in the Arctic ocean, and the island of Saghalin, off the mouth of the Amur, in the Sea of Okhotsk, an arm of the Pacific. The coast-line is very extensive, but the Arctic ocean is ice-bound at least ten months out of the twelve, and is almost valueless for commercial purposes, and the Sea of Okhotsk, on the Pacific, is infested with masses of floating ice and dense fogs. The principal ports are Vladivostok, on the Sea of Japan, the chief naval station of Russia on the Pacific; Okhotsk, on the Sea of Okhotsk; and Petropavlovsk, on the east coast of Kamchatka. Siberia enjoys a warm summer, but the winter is exceedingly severe. South Siberia has, in many parts, a very fertile soil, which yields rich crops of wheat, rye, oats, and potatoes; but immense tracts of Siberia are utterly unfit for tillage, more particularly the tundras or great stretches of boggy country along the Arctic ocean. In the west are extensive steppes. Roughly speaking, the northern limits of agriculture are 60° n. lat. Cattle-breeding and bee-keeping are largely pursued. Hunting and fishing are also

sources of remuneration, ermines, sables, and other fur-bearing animals being numerous. The wild animals include the elk, reindeer, and other deer, bear, wolf, white and blue fox, lynx, etc. The forests are extensive and valuable. Large quantities of gold are obtained, as well as silver, platinum, lead, iron, coal, etc. The chief towns are Irkutsk, capital of Eastern Siberia and a trading city; Tomsk, capital of gov. Tomsk, a trading city, with a university; and Tobolsk (20,130), capital of Western Siberia. Yermak the Cossack entered Western Siberia in 1580, and made a rapid conquest of the western portion of the country, which he handed over to Ivan the Terrible of Russia. Bands of hunters and adventurers then poured across the Urals, attracted by the furs, and gradually penetrated to the Arctic ocean and the Pacific. The latest acquisitions by Russia were the Amur territory, and coast regions of Manchuria ceded by China in 1858 and 1860. Exile to Siberia began soon after the conquest, and ever since Siberia has been a great penal colony. Hardened convicts and important political offenders are kept under close control, but the great majority of the exiles are simply placed in a particular district and allowed to shift for themselves. The Russian population of Siberia, which is more than three-fourths of the whole, consists mainly of exiles or the descendants of exiles. The other inhabitants include Buriats, Yakuts, Tungus, Tartars, Kirghiz, Samoyedes, etc. Some railways exist in Western Siberia, and a great trunk-line has been laid across Siberia, crossing also Manchuria, to Port Arthur and Vladivostok on the Pacific. Attempts have been made with partial success to open up an over-sea trade between Britain and Siberia by way of the Kara sea and the Yenisei.

SICARD (sē-kār), Roch-Ambroise Cucurron, famous in the history of the education of deaf-mutes, was born in 1742 near Toulouse, France. He became in 1786, director of the school for deaf-mutes established by the Archbishop of Bordeaux in the city of that name, whence, in 1789, he removed to Paris as successor to the Abbé de l'Épée, in whose system he made some important improvements. He also wrote several works on the instruction of deaf-mutes. He died in 1822.

SICILIES, Kingdom of the Two, a former kingdom of Italy, consisting of Naples (or South Italy) and Sicily. In 1860, an insurrection broke out in Sicily, and an expedition of volunteers from Piedmont and other Italian provinces under Garibaldi sailed from Genoa to the assistance of the insurgents. The result was that the Neapolitan troops were driven from the island. Garibaldi, following up his success, crossed over to the mainland, where he met little or no opposition; Francis II. fled from Naples; the strong places in his hands were reduced; and by a popular vote the Kingdom of the Two Sicilies ceased to exist as such, and became an integral part of the Kingdom of Italy.

SICILY, the largest island of the Mediterranean, belonging to Italy, from the southwestern extremity of which it

is separated by the narrow strait of Messina, about 2 miles wide; area, 11,289 sq. miles, divided into seven provinces; pop. 3,529,266. The soil is very fertile. Three-fourths of the cultivated surface are covered with cereals, chiefly wheat, though oats and barley are also grown. Cotton, sugar, and tobacco are also cultivated to some extent. Fruits of every variety are extensively grown, including large quantities of oranges and lemons. The vine flourishes almost everywhere, and much wine is produced. The chief exports are fruits, wine, and sulphur, besides olive-oil, sumach, cream of tartar, etc. Sicilian sulphur is extensively exported, the center of this trade being Girgenti on the south coast. Tunny and sardine fisheries are carried on round the coast. The chief seats of foreign commerce are the three principal towns, Palermo, Messina, and Catania. At the dawn of history the older races inhabiting Sicily the Iberian Sicani, from Iberia (Spain), and the Siculi from Italy, are seen to be hemmed in by Phœnician and Greek colonies. The Greeks, who entered the island in the 8th century B.C., founded the great cities of Syracuse, Agrigentum, and Messina, drove the Phœnicians to the northwest coast, and spread their influence and culture over the whole island. Greek art and literature here flourished, and many Greek names of distinction are connected with Sicily. The Carthaginians latterly took the place of their kinsmen, the Phœnicians, and between them and the Greeks a struggle ensued, which ended in favor of the latter (480 B.C.). War with the Carthaginians (1st Punic war) brought the Romans to Sicily, and having acquired the Carthaginian portion of the island (241 B.C.) they extended their rule over the whole, Sicily becoming a Roman province in 212 B.C. On the decline of the Roman Empire the island was overrun by the Goths, who retained possession till A.D. 551, when Sicily became part of the Byzantine empire. In the beginning of the 9th century the Saracens became masters, and continued so till their expulsion by the Normans in the 11th century, who remained long enough in possession to establish the feudal system in all its rigor. For a continuation of the history of Sicily see Sicilies (Kingdom of the Two).

SICKLE, a reaping-hook; a curved blade of steel with a handle, and having the edge of the blade in the hollow of the curve, used for cutting grain and the like. The sickle has been mostly superseded by the scythe, and the scythe in turn has given place to the reaping-machine.

SICKLES (sik'lz), Daniel Edgar, American soldier and politician, was born in New York City in 1825. In 1853 he was appointed corporation counsel of New York City, and was secretary of legation at London under United States Minister Buchanan from 1853 to 1855. In 1856 he was elected to the New York state senate. From 1857 to 1861 he was a democratic member of congress. He was appointed brigadier-general of volunteers in September, 1861, and major-general in November, 1862. On the second day of the battle of Gettysburg

his corps sustained the brunt of the confederate attack upon the Peach Orchard, on the federal left, and Sickles himself lost a leg. In 1869 he was retired with the full rank of major-general. He was United States minister to Spain from 1869 to 1873. He was sheriff of New York county in 1890, was again elected to congress as a democrat in 1892, and for several years was president of the New York State Board of Civil Service Commissioners.

SIDDONS, Mrs. Sarah, daughter of Roger Kemble, was born at Brecon, South Wales, in 1755. She commenced her theatrical career when quite a child, and in her nineteenth year was married to William Siddons, an actor in her father's company. For thirty years she continued to astonish and enchant the lovers of the drama, and having acquired an ample fortune, she took her leave of the stage in 1812. Her greatest characters were Queen Catharine in Henry VIII., and Lady Macbeth. In her art she was a close and systematic student, while in private life she enjoyed the respect of all who knew her. She died June 8, 1831.

SIDEREAL TIME, time measured by the apparent motion of the stars. A sidereal day is the time from the passage of a star across the meridian till its next passage, and is exactly the period of the revolution of the earth on its axis. It is the most constant unit of time which we possess. Its length is 23 hours 56 minutes 4.098 seconds. A sidereal year is the period in which the fixed stars apparently complete a revolution and come to the same point in the heavens, and is the exact period of the revolution of the earth round the sun. There are 366.2563612 sidereal days in a sidereal year. See Day.

SIDNEY, Sir Philip, one of the most conspicuous figures at the court of Queen Elizabeth, was the son of Sir Henry Sidney of Penhurst, Kent, where he was born in 1554. In 1585 he went to the Netherlands with his uncle Dudley, earl of Leicester, who commanded the forces sent to assist the Dutch against the Spaniards, and he was appointed governor of Flushing and general of horse, but at Zutphen, September 22, 1586, he was mortally wounded, and died at Arnheim, October 7. He was a soldier and statesman of great promise, and his contributions to literature, though not numerous, were of great importance. They include the *Arcadia* (1590), a romance in a medley of prose and verse in Italian style then popular. *Astrophel and Stella* (1591), the first important body of sonnets in the English language; and the *Defense of Poesy*, first published in 1595 as an Apologie for Poetrie.

SIDON, or **ZIDON**, a seaport of Syria, situated on the eastern coast of the Mediterranean, between Lebanon and the sea, about midway between Beyrout and Tyre, was long the principal city of Phœnicia (1600-1300 B.C.). Its artistic products were famous at an early period, as also its manufactures of glass, linen, purple dye, and perfumes, and in commercial enterprise it occupied a distinguished position. In the Persian, Grecian, and Roman periods it was still

great and populous, and even in the middle ages it was a place of considerable importance. During the crusades it was taken and retaken several times. It was almost completely destroyed during the troubles of the 13th century, but in the 15th it reappeared, under its modern name of Saida, as the port of Damascus. The trade is now unimportant. Pop. 9000.

SIEDLCE (syed'l-tse), a town of Russian Poland, capital of the government of the same name, 57 miles e.s.e. of Warsaw, the seat of a bishop. Pop. 23,714.—The government of Siedlce, between the Vistula and the Bug, has an area of 5535 sq. miles, and a pop. of 775,316.

SIEGE, the surrounding or investment of a fortified place by an army with a view to its capture. The taking of a fortified place may be attempted (1) by surprise, (2) by a sudden onset, (3) by blockade out of gunshot, (4) by a siege, properly so called. In a regular siege the fortress is first blockaded, so as to cut off all intercourse from without, the besieging force encamping just beyond reach of the enemies' guns. Then if any detached works are situated before the fortress, their capture must be effected in order to admit the opening of the trenches. The trenches are formed in the direction of the fortress; but that they may not be enfiladed from thence, they must proceed in a zigzag form. For the protection of the workers trenches called parallels, because they run in a direction parallel or nearly so to the sides of the fortress, are dug at intervals. While the trenches are being opened, the besieged, by sallies and counter operations of every kind, strive to drive off the besiegers, and to destroy their work; and the besiegers make efforts to establish themselves more and more securely, to raise batteries, and then, by means of trenches and advanced parallels, to approach the walls of the fortress; and all the while the artillery is kept constantly playing from the batteries of the besiegers as well as from the works and guns of the besieged. From the last parallel, which approaches very near the fortress, the besiegers prepare to make breaches. Here likewise mining operations are carried on whenever they are found advisable. When at last the breaches are practicable the storming or scaling of the walls follows.

SIEMENS, Sir Charles William, engineer, born in Hanover, 4th April, 1823, was educated at the gymnasium at Lübeck, the polytechnic school at Magdeburg, and the University of Göttingen. After a training in engineering and electricity in the workshops of Count Stolberg he migrated to London in 1843, and at a later date was joined by his brother (Werner), who joined with him in his various undertakings. The great works of Siemens Brothers at Charlston, West Woolwich, for the manufacture of submarine electric telegraph cables, were established in 1858; and the great steelworks at Landore, Swansea, in 1868. He labored mainly in two distinct fields, the applications of heat and the applications of electricity, and won a great reputation in both. He

was knighted April, 1883. He died November 19, 1883. Werner died in 1892.

SIENKIEWICZ (syën-kyë'vëch), Henryk, famous Polish novelist, was born in Wola Okrzejska, Government of Siedlce, in 1846. In 1880 he published the novel *The Tartar Bondage*. Among his other works are: *With Fire and Sword*, with its sequels, *The Deluge* and *Pan Michael*, *Without Dogma*, *The Children of the Soil*, and *Knights of the Cross*. The success of *Quo Vadis* was enormous, and it has several times been dramatized. His works have been translated into several European languages.

SIEN'NA, or **SIENNA EARTH** a ferruginous ochreous earth, which when raw is of a fine yellow color, and when burned assumes a rich orange-red tint. It is used as a pigment in both oil and water-color painting.

SIERRA LEONE (si-er'ra le-ö'ne), a British colony and protectorate on the coast of Western Africa. The colony proper consists of the peninsula of Sierra Leone, Sherbro and other small islands, and the coast region from the French territory on the northwest to Liberia on the southeast; area in occupation, about 3000 sq. miles. The protectorate, bounded inland by French territory, has an area of 30,000 sq. miles, and is divided into districts under commissioners. The inhabitants of the colony depend chiefly upon trade, and are mostly collected in Freetown (the capital) and the neighboring villages. The exports are palm kernels, palm-oil, rubber, ground-nuts, kola-nuts, gum-copal, hides, ginger, and benné-seed. The trade is chiefly with Great Britain. One great obstacle to the prosperity of the colony is the deadly nature of its climate, particularly to Europeans, and Sierra Leone was long known as the "white man's grave." But Freetown (pop. 40,000), in particular, has become healthier since getting a supply of good water, with other sanitary improvements. It is the chief seaport of western Africa. Pop. 1,080,000.

SIERRA NEVA'DA (Spanish, "Snowy Range"), a chain of mountains in Southern Spain, the most elevated in the peninsula. The greater part of it is in the province of Granada, running east and west, and the highest peak is Mulahacen, which has an elevation of about 11,678 feet, and is capped with everlasting snow. The range is rich in fertile valleys and picturesque scenery.

SIERRA NEVADA, a mountain range of the United States, in California, extending north and south along the eastern boundary of the state. It consists of an aggregate of ranges, some 70 miles wide, with numerous peaks reaching 10,000 and several nearly 15,000 feet, Mt. Whitney (14,868) being the highest in the states. The Yosemite valley is in the Sierra Nevada.

SIEYES (syë-yās), Emmanuel Joseph, better known as the Abbé Sieyès, was born at Fréjus in 1748, and pursued his studies for the church at Paris. He originated the idea of the new geographical division of France into departments, arrondissements, and communes. In 1791 he became member for the Seine department, and in 1792 deputy for

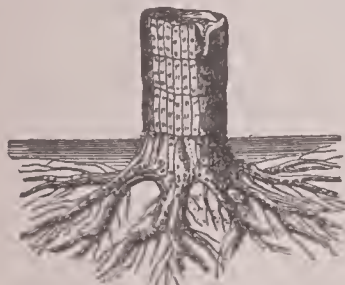
the department of Sarthe. In 1799, on his return from a mission to Berlin, by which he secured the neutrality of Prussia, he became a member of the directory. He retired with the title of count, and obtained grants of land and property to the value of at least \$200,000. He was exiled at the restoration, but returned on the July revolution of 1830, and died at Paris in 1836.

SIGEL (së'gel), Franz a German-American soldier, was born at Sinsheim, in Baden, in 1824. In 1852 he emigrated to the United States. On the outbreak of the civil war he took the side of the north, organized a regiment of infantry and a battery of artillery, which rendered good service in the occupation of Camp Jackson. At the battle of Pea Ridge, March 8, 1862, he ordered a well-timed charge which decided the day. He commanded the First Corps in the campaign which terminated with the second battle of Bull Run, August, 1862, and in February, 1864, was given command of the department of West Virginia. He successfully defended with 4000 men Maryland Heights against General Early with 14,000 men. He resigned from the army in May, 1865. From 1871 until 1874 he was register of New York City, and from 1886 until 1889 was United States pension agent at the same place. He died in 1902.

SIGHT, Defects of, are usually caused by anomalies in the shape of the eye. (See Eye.) The normal eye is an optical apparatus so constructed that the images of distant objects are thrown with sharpness on the retina; if this is not the case the objects are not seen distinctly. There are two very common instances of defective eyesight, short-sight or myopia and long-sight hypermetropia, the one being the reverse of the other. In the former case, owing to the too great power of the crystalline lens, or to the eye cavity extending too far backward, images from objects at some distance are formed in front of the retina. The sight of the myope is thus confused or absolutely defective for objects beyond a certain short range, but on the other hand it is very clear for near objects. The remedy for myopia is the employment of biconcave glasses, which, if the myopia is not considerable, need only be used for looking at distant objects. In the case of hypermetropia objects are seen distinctly only at a range beyond that belonging to normal vision. Owing to the shortness of the eye cavity the lenses in this case are unable to converge the rays to a focus within the limits of the eye-chamber, the image being therefore formed (theoretically) behind the eye. This defect is corrected by the use of convex lenses, which, by converging the rays of light, cause the image to fall on the retina. Both these defects are usually congenital. A similar defect to hypermetropia is that of presbyopia, which usually comes on with advancing years, and is due to diminished focussing power and lessened elasticity of the lens, the result being that the image of a near object is not clearly formed on the retina but behind it, while distant objects are seen as well as ever. The remedy in this case also is convex lenses.

Astigmatism is a defect usually characterized by asymmetry in the curvature of the cornea in different meridians. Opacities in the cornea or crystalline lens, etc., are also not uncommon causes of defective eyesight.—Double-vision is when, as in some cases of squinting, each eye sees things separately; or it may result from muscular paralysis.—Night-blindness or hemeralopia is a peculiar defect by which a person becomes suddenly and entirely blind when night comes on, though he can see perfectly well in the daytime.

SIGILLARIA, a genus of fossil plants found in great abundance in the coal measures. The plant occurs in the form of compressed stems attaining a height of 40 to 50 feet, and a breadth of 5 feet. The stem generally occurs as a double layer of coal with a fluted outer surface, and showing, at regular intervals, the



Sigillaria in a coal-mine.

scars produced by the bases of the leaf-stalk. Their roots are found in the shale and are known by the name of stigmaria, being at first supposed to be distinct plants. No foliage of any kind has been found connected with the trunk. Some suppose sigillarias to be allied to tree-ferns, others to Coniferæ.

SIGISMUND (sij'is-mund), German emperor from 1411-37, was born in 1368, and on the death of his father, the emperor Charles IV., he obtained the margraviate of Brandenburg. He married Mary, daughter and heiress of Louis the Great of Poland and Hungary; but on the latter's death in 1383 the Poles elected Mary's sister as queen; Sigismund, however, was crowned king of Hungary in 1387. He was crowned emperor at Aix-la-Chapelle in 1431, and at Milan, and again at Rome in 1433. He was now in possession of the imperial crown and the crown of four kingdoms. He died at Znaim in 1437.

SIGNAL CORPS, the system of signal service now in use throughout the United States was first suggested immediately prior to the civil war by Gen. A. J. Meyer, an officer of the United States army, at that date connected with the surgeon-general's department. The difficulty of communication between various divisions of the army, particularly at points where facilities for communicating by telegraph were wanting, was the cause of serious embarrassment at times, and gave birth to the service which has since obtained. General Meyer's plan was to adopt certain principles of telegraphy, as for example the dots and dashes used to represent letters of the alphabet, substituting therefor flags, which were waved in one direction to indicate dots, and in another direction

to indicate dashes. By this means operators separated at a distance of from half a mile to ten miles would be enabled to frame communications that could be readily comprehended by those to whom they were addressed. After night-fall, or at times when the atmosphere was obscured to a degree that prevented the successful employment of flags, colored lights were used and found equal to the requirements of the occasion. The plan was first utilized at points on the frontier; and when, during the progress of the civil war, the difficulty that brought the system into existence was experienced, it was adopted, and became one of the most valuable auxiliaries enlisted in the service.

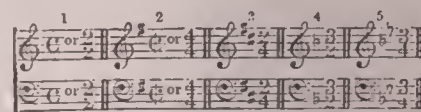
Appropriations for the support and maintenance of the system were regularly included in the bills adopted by congress for the support of the army, and its worth and efficiency were further acknowledged by the same authority in providing for the establishment of a school of instruction at Arlington, near Washington. The education there obtainable, both practical and theoretic, is designed to thoroughly equip students for the scientific work they will be called upon to execute, and results show that expectations thus indulged have been fairly realized.

When the war terminated the system had attained a high degree of perfection, its value was universally recognized, and its development was continued, with improved results. It was introduced into the navy, and was the chief impulse in the establishment of the international code in 1901. Wireless telegraphy is now an important subject of experiment for purposes of signaling. The signal corps of the United States army has perfected its own system and has in successful operation stations in San Francisco harbor and elsewhere. See Weather Signals.

SIGNALS are the means of communicating to the eye—as by flags, lights, etc., and to the ear—as by guns, steam-whistles, fog-horns, rockets, etc., intelligence to greater distances than can be reached by the human voice. The most complete system of signaling is that devised to enable ships to communicate when at some distance. The new system introduced in 1902, provides a flag for each letter of the alphabet, five being pennants, two burgees, and the rest square flags. Besides these there is the code flag or answering pennant. All are distinctly colored so as to be visible for a considerable distance. With the twenty-six alphabetical flags, 650 two-flag signals and 15,600 three-flag signals can be hoisted; and in the code-book definite meanings are attached to most of these combinations. If the code flag be hoisted above two alphabetic flags, a latitude or longitude is signalled; if below two such flags, the signal denotes a number. Some single flags have special meanings when hoisted alone; few signals require more than three flags, and there are never more than four flags hoisted at once. When, owing to distance or the state of the atmosphere, the colors of the flags cannot be made out, one of three systems of distant signals is used. These involve the use of

(1) cones, balls, and drums; (2) balls, square flags, pennants, and whefts; and (3) a fixed semaphore. In the army signalling is carried on during the day by means of flags, sun-flashes (see Heliograph), etc.; and during the night by means of colored lamps, or by a system of long and short flashes of light. On the railways signaling is effected by the semaphore, colored lights, and during fog by cases filled with detonating powder and placed on the rails at certain places, to be exploded by the wheels of the passing locomotive. See Fog-signals and Heliostat, and Weather Signals.

SIGNATURE, in music, the signs placed at the commencement of a piece of music. They are of two kinds, the time signature and the key signature. The key signature, including the clefs, is usually written on every stave; and the sharps or flats there occurring affect all



Key and Time Signatures on the Treble and Bass Clefs.

1. Key of C; two minims (or their equivalents) in the bar. 2. Key of G; four crotchets in the bar. 3. Key of D; two crotchets in the bar. 4. Key of F; three minims in the bar. 5. Key of B flat; three crotchets in the bar.

notes of that degree (with their octaves) throughout the piece. The time signature is only placed at the beginning of the first line and where changes occur. It indicates the number of aliquot parts into which the bar is divided, as shown above.

SIGSBEE, Charles Dwight, American naval officer, was born at Albany, N. Y., in 1845. From 1874 to 1878 he was employed in exploring the bottom of the Gulf of Mexico, and received the order of the Red Eagle of Prussia and a gold medal for improvements which he introduced in the work. In 1882 he was assigned to the command of the battleship Maine, which, while still under his command, was destroyed in the harbor of Havana, Cuba, on February 15, 1898. During the war against Spain he commanded the auxiliary cruiser Saint Paul. From September, 1898, to January, 1900, he commanded the battleship Texas. He wrote Deep Sea Sounding and Dredging, U. S. Coast Survey, and Personal Narrative of the Battleship Maine.

SIGURD, or **SIGURDR**, in northern mythology, the hero of the Volsunga Saga, on which the Nibelungenlied is based. According to the legend of the Volsungs, Sigurd (the Siegfried of the Nibelungenlied) is the posthumous son of Sigmund, son of Volsung, a descendant of Odin. After obtaining the golden treasure by slaying the dragon Fafnir with his good sword Gram he eats the monster's heart, and thus acquires the power of understanding the songs of birds. He then rides through a volume of flame surrounding a house in which the fair Brenhyldr (Brunhild) lay asleep. He wakes Brenhyldr, to whom he plights his troth, and then rides to the palace of Giuki the Niflung, whose wife gives him a potion which causes him to forget Brunhyldr, and he marries Gudrun (Chriemhild), Giuki's daughter. Her

brother Gunnar (Gunther) determines to marry Brenhyldr, but is unable to ride through the flames; so his mother by her arts causes Sigurd to go through the flames and bring away Brenhyldr in the form of Gunnar. Sigurd then resumes his shape, and Brenhyldr is handed over to Gunnar. When Brenhyldr hears the true story of her rescue her love for the hero turns to hatred, and she seeks to slay him. Sigurd is eventually killed by Gunnar's half-brother. His death revives Brenhyldr's love, and she dies of a broken heart.

SIKHS (from a Sanskrit word meaning "disciple"), a religious sect in North-western Hindustan which worships one only and invisible God. Its founder was Nanak Shah, born in 1469 in the province of Lahore. He labored to lead the people to a practical religion, to a pure worship of God and love to mankind. He died about 1540. Of his successors Arjun-mal gave stability and unity to the religion by publishing Nanak's writings in the *Aid-Granth*, the first sacred book of the Sikhs. The Sikhs had now rejected the authority of the Koran and the Vedas, and thus aroused the enmity both of the Mohammedans and Brahmans. Arjunmal was thrown into prison, where he died. His son and successor Har Govind transformed the Sikhs from peaceful believers into valiant warriors, and under his reign began the bloody contest with the Mohammedans. The real founder of the Sikh state was Govind Sinh or Singh, the tenth ruler from Nanak. He abolished the system of castes, and gave all men equal rights. His followers, owing to their valor in the protracted contest with the Mohammedans, received the title of Sinhs or lions. Govind Sinh wrote the *Dasema Padshah ke Granth*, or book of the tenth prince, which, besides treating of religious subjects, contained the history of the author's exploits. The Sikhs hold it in equal veneration with the *Adi-Granth*. Govind Sinh died in 1708, and the Sikhs gradually yielded to the superior power of the Mohammedans. A small number of the Sikhs escaped to inaccessible mountains, and preserved the doctrines of their fathers and an inextinguishable hatred toward the Mohammedans. After Nadir Shah's return to Persia they left the mountains and subdued all Lahore. The Sikhs then broke up into a number of independent communities, each governed by a *sidar*; but in 1792 Runjeet Singh established himself as despotic ruler of the Sikhs, with the title of Maharajah. The territory of the Sikhs now comprehended the whole Punjab, part of Multan, and most of the country between the Jumma and Sutlej; total area, 69,000 sq. miles. After Runjeet Singh's death in 1839 a period of anarchy followed. In 1845 (first Sikh war) the Sikhs attacked the British under Sir Hugh Gough at Mudki. Here they were repulsed (December 18), and again defeated at Ferozeshah three days later. On January 20, 1846, the Sikhs were routed by Sir H. Smith near Aliwal, and on the 10th February by Gough at Sobraon. A treaty was signed by which Britain held the city of Lahore, and a British resident took supervision of the government. In 1848 a general

revolt broke out, and it was evident that the Sikhs had resolved on a decisive struggle, being also assisted by the Afghans. In this the second Sikh war Lord Gough advanced with an army against them, but received a severe check at Chillianwalla, 13th January, 1849. Both armies were then reinforced and on the 21st February, at Gujerat, the power of the Sikhs was completely broken. The Sikh dominion was proclaimed at an end on the 29th March,



Sikh soldiers.

and the Punjab was annexed to the British empire in India, the Maharajah Dhulip Singh receiving an annuity of \$250,000. (See Punjab.) The bulk of the Sikhs are of Jât origin; they are of fine physique, and possess great powers of endurance as well as courage. During the mutiny the Sikhs displayed the utmost loyalty to the British. They number about 1,876,500, or $\frac{1}{15}$ th of the population of the Punjab, and compose the mass of the gentry in the region between the Five rivers.

SILE'SIA, a territory of Central Europe, now divided politically between Prussia and Austria. Prussian Silesia (15,556 sq. miles; pop. 4,868,378) is bounded east by Posen and Poland, south by the Austrian territories, west and north by Saxony and Brandenburg. The province is intersected by branches of the Sudetic mountains in the south, but is level toward Brandenburg and Posen, and although in parts marshy and sandy, is yet fertile. The principal river is the Oder. Silesia produces corn, flax, madder, hemp, hops, tobacco, fruits, and tolerable wines. The mountainous parts yield timber and afford good pasturage and meadow land. Minerals include iron, copper, lead, silver, coal, sulphur, etc., and there are mineral waters in several places. Linen, cotton, and woolen goods, and leather are the chief manufactures. Silesia is divided into three governments—Breslau, Liegnitz, and Oppeln. Breslau is the capital. Austrian Silesia consists of that part of Silesia which was left to Austria; area, 1988 sq. miles. It is mountainous, and although the soil is

not in all parts favorable, it is rendered productive by the industry of the inhabitants, who are also extensively engaged in linen, cotton, and woolen manufactures. Pop. 680,422.

SILHET, or **SYLHET**, chief town in the district of the same name, Assam, Hindustan, on the right bank of the Surmá. Pop. 14,407.—The district, area 5413 sq. miles, consists of a uniform level, intersected by a network of rivers and drainage channels. During the rainy season the western part of the district is submerged. The principal crop of the low ground is rice. Pop. 1,969,009.

SILHOUETTE (sil-y-et') is the representation of the outlines of an object filled in with black color, in which the inner parts are sometimes indicated by lines of a lighter color, and shadows or extreme depths by the aid of a heightening of gum or other shining medium. The name comes from Etienne de Silhouette, French minister of finance in 1759, in derision of his economical attempts to reform the financial state of France while minister. During this period all the fashions in Paris took the character of parsimony, and were called *à la Silhouette*. The name has only remained in the case of these drawings.

SILICA, a compound of oxygen and silicon, forming one of the most frequently occurring substances in the materials of which this globe is composed. Silica forms a principal ingredient in nearly all the earthy minerals, and occurs either in a crystallized form or in amorphous masses. In its naturally crystallized form it is known as rock-crystal. Colored of a delicate purple these crystals are known as amethyst, and when of a brown color, as Cairngorm stone. Silica is also met with in the form of chalcedony and carnelian. It enters largely into the lapidary's art, and we find it constituting jasper, agate, cat's-eye, onyx, and opal. In opal the silica is combined with water. The resistance offered by silica to all impressions is exemplified in the case of flint, which consists essentially of silica colored with some impurity. Silica is found to constitute the great bulk of the soil which serves as a support and food of land plants, and it enters largely into the composition of many rocks. Many natural waters present us with silica in a dissolved state. It is, however, not soluble in pure water. The action of an alkali is required to bring it into a soluble form. Silica forms a number of hydrates, which have acid properties, and from which a vast number of salts known as silicates are obtained.

SILICATE PAINT, natural silica, when dried and forming an almost impalpable powder, mixed with colors and oil. Unlike the ordinary lead paints, all the silicate colors are non-poisonous. Silicate white has great covering power; it is not affected by gases; and heat of 500° is successfully resisted.

SILICUA'RIA, a genus of marine gasteropodous molluscs, found both fossil and recent. The shell is tubular, spiral, at its beginning, continued in an irregular form, divided laterally through its whole length by a narrow slit, and formed into chambers by entire septa.

SILK, the peculiar glassy thread spun

by the caterpillars or larvæ of certain species of moths, and a well-known kind of fabric manufactured from it. The chief silk-producing larvæ belong to the family of the Bombycidae, of which group the common silk-moth (*Bombyx mori*) is the most familiar species, being that which is by far the most important in artificial culture. This family of moths is distinguished by the small size of the proboscis, by the thick hairy body; and by the large broad wings. The common silk-moth possesses a short body, stout legs, and white wings, which are marked by black lines running parallel with the wing borders. The female moth deposits her eggs in summer on the leaves of the mulberry-tree. For hatching artificially the eggs are placed in a room heated gradually up to a temperature of about 80° Fahr. In eight or ten days the young appear. The caterpillars are then covered with sheets of paper on which mulberry leaves are spread, and make their way through perforations in the paper to the mulberry leaves, their natural food. The leaves when covered with caterpillars are laid on shelves of wicker-work covered with brown paper. When first hatched the larvæ or worms are black and about $\frac{1}{4}$ inch long. The larval or caterpillar stage lasts from six to eight weeks, and during this period the insect generally casts its skin four times. After casting its last skin the insect is about 2 inches long, and in ten days attains its full growth of 3 inches. The insect's body consists of twelve apparent segments, with six anterior forelegs, and ten fleshy legs or "prolegs" provided with hooks in the hinder body-segments. The mouth is large, with powerful jaws. At this stage the insect becomes languid, refuses food, and prepares for its next change into the pupa or chrysalis stage. Oak, broom, or other twigs are now laid on the wicker-frames, and the worms crawl into these, where they spin their cocoon by winding a self-produced silk thread many times round their body. This silky thread is formed from a glutinous secretion contained in two tubular glands on either side of the body, opening on the lower lip of the larva in a prominent aperture called the spinneret. This secretion becomes tenacious and threadlike when brought in contact with the air, and the two filaments unite as they issue from the spinneret, apparently by the glutinous secretion of another and special gland. The spinning of the pupa-case or cocoon lasts from three to five days. After passing about three weeks in the nymph or chrysalis stage, the larval form emerges from the cocoon as the perfect moth or imago. But those insects destined to afford the silk material are not allowed to enter the imago stage. The completed cocoon with its contained larva is thrown into warm water, which dissolves the glutinous matter cementing the threads together, and facilitates the unwinding of the silk. The average length of a thread furnished by a single cocoon is 300 yards. About 12 lbs. of cocoons yield 1 lb. of raw silk, and 1 oz. of silk-worms' eggs will give 100 lbs. of cocoons. The female moth produces from 300 to 500 eggs.

The Chinese appear to have been the first to render the filamentous cocoon substance serviceable to man, and China is still the chief silk-producing country in the world. Before the reign of Augustus the use of silk was little known in Europe, and the culture of the silk-worm was not introduced until the 6th century. It was at first confined to Constantinople, but soon spread to Greece, and then through Italy to Spain. When the Duke of Parma took Antwerp in 1585 a check was put on its trade in silk goods, and many of the weavers from Flanders and Brabant took refuge in England. In 1685 the Edict of Nantes drove hosts of silk weavers into exile, as many as 50,000 having settled in Spitalfields, London. A silk-throwing machine, constructed



Silk-worm—Larva, chrysalis, and cocoon.

on Italian models secretly obtained, was fitted up at Derby in 1714 by Thomas Lombe (afterward Sir Thomas Lombe), who obtained a patent in 1719. In France looms were set up at Lyons in 1450, and at Tours in 1470. The first nursery of white mulberry-trees was founded by a working gardener of Nismes, who ultimately propagated them in many districts in the south of France. Italy is now the chief silk-producing country in Europe, France coming next.

In the manufacture of silk the first operation is the unwinding of the cocoon and the reeling of the silk. For this purpose they are placed in shallow vessels containing hot water, which softens the gummy matter of the cocoons. The ends of the filaments are then conducted by guides to large reels moved by machinery. Four or five (or more) threads from as many different cocoons are thus brought together, and uniting by the gum form one thread. When the cocoon is half unwound the filament decreases 50 per cent in thickness. The silk thus produced is called raw silk. Before it can be woven into cloth the raw silk must be thrown. This is often a special trade, and is usually conducted by machinery in large mills. Previous to throwing, the silk is carefully washed, wound on bobbins, and assorted as to its quality. In the throwing-machine it is again unwound from the bobbins, and then wound on a reel. The twist of the silk is regulated as required by varying the relative velocities of the flyer and reel. The silk thus prepared is called singles, and is used for weaving common or plain silks and ribbons. The next operation, called doubling, is the twisting of two or more of these threads on one bobbin. This is done

in a throwing machine, and the silk thus spun is called tram silk, commonly used for the weft of richer silks and velvets. Two or more of these threads of tram-silk twisted in the throwing-mill together constitute organzine, a species of silk thread used for warps of fine fabrics. But in tram-silk the threads are all twisted in one direction, forming individual strands like twine, whereas in organzine the collected threads are twisted in an opposite direction to the twist of the strands, like cable or rope. The silk in this condition is called hard in consequence of the gum, which is, however, separated by careful boiling. The throwing-machine has been greatly improved both as to accuracy and produce by assimilating it to the cotton throstle. The manufacture of waste silk is quite different from that just described, being more akin to that of wool or cotton. Waste silk consists of the floss-silk or outer fibres of the cocoons; of the silk of defective cocoons, such as those from which the moths have been allowed to issue; of the remains of cocoons from which the fibre has been mostly reeled, etc. Until about 1857 this was entirely useless, but is now the object of an important industry, being cleared of the gum by boiling, and subjected to such processes as breaking, combing, drawing, and roving, till it is ready for spinning. Owing to the protective policy the manufacture of silk in the United States has attained considerable dimensions.

SILK-COTTON TREE, a tree belonging to the natural order Sterculiaceæ, indigenous to the West Indies and South America. It has a reddish and prickly stem and palmated leaves. The flowers change from white to red, and the wood is soft and spongy. The down which is contained in the seed capsule is used for stuffing pillows, chairs, sofas, etc. Canoes are constructed from the timber.

SILKWORM-GUT, a substance prepared from the silky secretion of the caterpillars of the ordinary silk-worm taken from the insects' body, and constituting the lustrous and strong lines well known to anglers under the name of "gut."

SILURIUS, a genus of fishes of the family Siluridæ, order Physostomi. This genus, of which five species are known, inhabits the temperate parts of Europe and Asia. The head and body are covered with soft skin, and the jaws have four or six barbeds. The only



Sly silurus.

species which occurs in Europe is sly silurus or sheat-fish (*Silurus planis*), found in the fresh waters east of the Rhine. It attains to a weight of 300 or 400 lbs., and the flesh is firm and well flavored. The family Siluridæ (otherwise named sheat-fishes) constitutes a very extensive section of fishes, the

species of which are, for the most part, confined to the fresh waters of warm climates. They present great diversity of form, but their most obvious external characters are the want of true scales. The mouth is almost always provided with barbules.

SILVER, one of the best-known metals. It appears to have been known almost as early as gold, and, without doubt, for the same reason, because it occurs very frequently in a state of purity in the earth, and requires but an ordinary heat for its fusion. Pure silver is of a fine white color. It is softer than copper but harder than gold. When melted its specific gravity is 10.47; when hammered, 10.510. Its chemical symbol is Ag. It is next in malleability to gold, having been beaten into leaves only $\frac{1}{10000}$ of an inch in thickness. It may be drawn out into a wire much finer than a human hair, and a wire of silver 0.078 of an inch in diameter is capable of supporting a weight of 187.13 lbs. *avoirdupois*. It excels all other metals as a conductor of heat and electricity. Silver melts when heated completely red-hot, and may be boiled and volatilized by a very strong and long-continued heat. It is rapidly volatilized when heated on charcoal by the flame of the compound blow-pipe. When cooled slowly crystals of silver may be obtained. Silver is not oxidized by exposure to the air neither is it affected by water, but it is blackened or tarnished by sulphuretted hydrogen. The atomic weight of silver is 108. Oxide of silver is produced by dissolving silver in a solution of nitric acid and precipitating with an alkali. Its specific gravity is 7.14. The compound called horn silver or chloride of silver is obtained by dissolving silver in nitric acid and mixing the solution with a solution of common salt. Its specific gravity is 5.550. When exposed to the light it turns to a blackish color, hence its great use in photography. Bromide of silver is the most sensitive to light of any known solid. It is used for coating the "dry-plates" employed in photography. When silver is long exposed to the air it acquires a covering of a violet color, which deprives it of its luster; this coating is sulphide of silver. Sulphide of silver occurs native as silver-glance. Silver readily forms alloys with iron, steel, lead, tin, and mercury. Of all the combination of acid and silver the most important is nitrate of silver, obtained by dissolving silver in nitric acid. If the silver and acid are pure the solution of silver nitrate is colorless, very heavy, and caustic; it stains the skin, and all animal substances, of an indelible black; after evaporation it deposits, on cooling, transparent crystals of nitrate of silver (which see).

There are five important silver ores, viz. native silver, vitreous silver (or silver-glance), black silver, red silver, and horn silver. The first is usually found in dentiform, filiform, and capillary shapes, also in plates formed in fissures and in superficial coatings; luster metallic; color silver-white, more or less subject to tarnish; ductile; hardness between gypsum and calcareous spar; specific gravity, 10.47. Native silver occurs principally in veins trav-

ersing gneiss, clay-slate, and other palæozoic rocks, but not usually in great quantity. It often forms a natural alloy with gold. Vitreous silver presents itself in various shapes, and is of a blackish lead-gray color with a metallic luster. It is malleable, about as hard as gypsum, and subject to tarnish; specific gravity, 7.19. It is more or less pure silver sulphide, and has been found almost exclusively in veins along with ores of lead, antimony, and zinc. It occurs in Saxony, Bohemia, Hungary, Mexico, and Peru; and is an important species for the extraction of silver. Black silver generally occurs in granular masses of an iron-black color. It is sectile and about as hard as gypsum; specific gravity, 6.2. This mineral is a composition of silver (about 68.5 per cent) with antimony and sulphur and traces of iron, copper, and arsenic. It is found in veins along with other ores of silver, and is a valuable ore for the extraction of silver. It occurs chiefly in Saxony, Bohemia, Hungary, and the American continent. Red silver is found in crystals and often massive, granular, and even as an impalpable powder. It is a double sulphide of silver and antimony, containing on an average 60 per cent of silver. It occurs in veins with other silver ores, galena, and blende. It is found in various parts of Saxony, also in Bohemia, Hungary, and Norway; but chiefly in Mexico, Peru, and the western states of America. Horn silver, or silver chloride, occurs in crystals and also in crusts and granular masses. It contains about 76 per cent of silver. It is found in the upper parts of veins in clay-slate, and also in beds with other silver ores or with iron-ochre. It is not abundant in Europe, but occurs in large masses in Mexico and Peru. The above are the ores of silver from which silver is chiefly extracted; but argentiferous sulphides of lead and copper are also smelted for the small proportion of silver they contain.

Silver is extracted from its various ores by smelting or amalgamation. The former method is founded on the great affinity of silver for lead, which, when fused with silver, acts as a solvent and extracts it from its union with baser metals. The silver is afterwards separated from the lead by the process of cupellation (see Assaying), which consists in exposing the melted alloy to a stream of atmospheric air, by which the lead is converted into an oxide (litharge) while the silver remains untouched. The latter method depends upon the property of mercury to dissolve silver without the aid of heat. The first is called the dry, the last the wet way of treating silver ores. One or the other process is employed according to the nature of the ores. The ores which are treated in the dry way are usually those consisting principally of argentiferous sulphide of lead. By this method the ore is first pulverized and roasted to expel the sulphur, and is then freed from the lead. The ores best adapted to the process of amalgamation are native silver and vitreous silver. The ores are first selected to form a proper mixture with reference to the quantity of silver and sulphur they contain. The sulphur is

then got rid of by adding to the mixture of an ore 10 per cent of common salt, by which, during the furnace operation, the sulphur is oxidized, and the acid thus formed unites with the base of the salt and forms sulphate of soda; while the hydrochloric acid thus set free combines with the silver in the ore that was not in the metallic state, and forms chloride of silver. In this state the ore is reduced to an impalpable powder by various mechanical processes. It is then submitted to the action of mercury, with which it forms what is called an amalgam. This amalgam is subjected to the action of heat in a distilling furnace, by which the mercury is sublimed, and the silver remains. Silver is sometimes separated from copper by the process of eliquation. This is effected by means of lead, which when brought into fusion with the alloy combines with the silver. The argentiferous lead thus obtained is subjected to the usual processes of cupellation, and the coarse copper from which the silver has been separated is refined. Large quantities of silver are now obtained from argentiferous lead ores by a process known as Pattinson's process, which depends on the property pure lead possesses of crystallizing at a temperature at which an alloy of silver and lead is still fluid, so that the solid crystals of lead can thus be removed.

The silver mines of North and South America are incomparably more important than those of all the rest of the world. The Mexican mines were worked before the Spanish conquest, and then produced large quantities of silver. Up to the present time their total yield has been estimated at \$3,000,000,000. Great deposits of silver have been discovered in the western states of America, particularly in Nevada, Arizona, California, Colorado, Idaho, Montana, New Mexico, and Utah, and the yield amounts to about \$35,000,000 annually. Silver ore, chiefly argentiferous galena, has also been found in great quantities in the Barrier ranges of New South Wales. Some of the mining concerns here are the largest in the world. Considerable quantities of silver are also produced in Europe. The average production of Germany is estimated at about \$4,000,000. In Britain silver is obtained from argentiferous lead ore to the value of over \$100,000 annually. The world's total production of silver at present is about \$100,000,000 annually.

SILVER-FIR, a species of fir, so called from two silvery lines on the under side of the leaves. It is a native of the mountains of the middle and south of Europe, but has long been common in Britain. It grows to the height of 150 to 180 feet, forming a very fine tree. Its timber is not so much prized as that of some other species, but is used for various purposes, and is durable under water. It yields resin, turpentine, tar, etc., especially the fine clear turpentine known as Strasburg turpentine. The American silver-fir, the balm of Gilead fir, yields the Canada-balsam used for optical purposes. Other species are also called silver-firs.

SILVER-FOX, a species of fox in-

habiting the northern parts of Asia, Europe, and America, and distinguished by its rich and valuable fur, which is of a shining black color, having a small quantity of white mixed with it in different proportions.

SILVERING, the application of silver leaf is made in the same way as that of gold, for which see Gilding. Several mixtures containing silver have long been in use for coating base metallic objects, but they have been almost all superseded by the modern process of electro-plating. (See Electro-metal-lurgy.) For a description of the silvering of mirrors see the article Mirror.

SIMBIRSK', an eastern government of Russia; area, 29,657 sq. miles. It consists in general of an extensive fertile plain watered by the Volga and its affluents. Agriculture and cattle-breeding are the leading industries. The principal crops are grain, hemp, flax, hay, and tobacco. Minerals are unimportant. There is an abundance of fish in the rivers and numerous small lakes. Pop. 1,481,811.—Simbirsk, the capital, stands on a lofty bank of the Volga, 448 miles e.s.e. of Moscow. It has wide streets and squares, a cathedral, etc. There is an annual fair, and a good trade in corn and fish. Pop. 43,298.

SIMEON, Tribe of, the descendants of Simeon, the second of Jacob's sons by Leah. They received a section in the southwest of Canaan, which was originally allotted to Judah.

SIMLA HILL STATES, a collection of twenty-three Indian native states surrounding the sanitarium of Simla; total area, 6569 sq. miles. The mountains of these states form a continuous series of ranges ascending from the low hills of Ambála (Umballa) to the great central chain of the Eastern Himalayas. The chief river is the Sutlej. The climate is genial, and the winters comparatively mild. Pop. 502,853.

SIMMS, William Gilmore, American author, born at Charleston, South Carolina, 1806; died 1870. He published in 1827 a volume of poems; but his best poem, *Atalantis, a Tale of the Sea*, appeared in 1833. This was followed by a series of romances founded on revolutionary incidents in South Carolina, and by several border tales and historical romances. Among these we may mention *Guy Rivers*, *The Yemassee*, *The Partisan*, *The Scout*, *Eutaw*. He was editorially connected with several periodicals, and filled several political offices.

SIMON (sē-mōn), Jules (properly Jules François Suisse Simon), a French philosopher and statesman, born at Lorient, department of Morbihan, 31st December, 1814, and educated in the *Ecole Normale*, Paris. In 1876 he became leader of the republicans, and was minister of the interior until 16th May, 1877, when he was dismissed by Mac-Mahon. He afterward edited the *Echo Universel*. His chief works include *Histoire de l'Ecole d'Alexandrie* (1844), *Le Devoir* (1854), *La Liberté de Conscience* (1859), *L'Ouvrière* (1863), *L'Ecole* (1864), *Le Travail* (1866), *La Peine de Mort* (1869), *Souvenirs du 4 Septembre* (1873), and *Le Gouvernement*

de M. Thiers (two vols, 1878). He died in 1896.

SIMONIDES (dēz), a Greek lyric poet, born in the island of Ceos about B.C. 556. At a competition for the best elegy upon those who fell on the field of Marathon, he gained the prize over Æschylus himself. Simonides is credited with the addition to the Greek alphabet of the long vowels and the double letters. Only fragments of the works of this poet have come down to us.

SIMOOM', a hot suffocating wind that blows occasionally in Africa and Arabia, generated by the extreme heat of the parched deserts or sandy plains. The air, heated by contact with the noonday burning sand, ascends, and the influx of colder air from all sides forms a whirlwind or miniature cyclone, which is borne across the desert laden with sand and dust. Its intense, dry, parching heat, combined with the cloud of dust and sand which it carries with it, has a very destructive effect upon both vegetable and animal life. The effects of the simoom are felt in neighboring regions, where winds owing their origin to it are known under different names, and it is subject to important modifications by the nature of the earth's surface over which it passes. It is called *Sirocco* in South Italy, *Kamsin* in Egypt and Syria, and *Harmattan* in Guinea and Senegambia.

SIMPLON (san-plōn), a mountain, 11,117 feet high, belonging to the Alps, in the canton of Valais, Switzerland, and celebrated for the road that passes over it, which commences near Brieg, on the Swiss side, and terminates at the town of Domo d'Ossola, in Piedmont. A railway tunnel 12½ miles long, costing over \$20,000,000, has recently been completed, which connects the lines from Geneva to Brieg, and from Domo d'Ossola to the Lago Maggiore.

SIMPSON, Sir James Young, M.D., the most eminent medical practitioner of his day, and the discoverer of the anæsthetic properties of chloroform, was born in 1811 at Bathgate in Linlithgowshire, died at Edinburgh 1870. His first paper on chloroform was read before the Medico-Chirurgical Society of Edinburgh on March 10, 1847, and it soon came into general use. He received honors from numerous scientific societies in Europe and America, and in 1853 was elected a foreign associate of the Academy of Medicine of Paris. In 1856 he received the laureateship and gold medal of the French Academy of Sciences, with the Monthyon prize of 2000 francs awarded for "most important services done to humanity." He first expounded acupressure in a paper read before the Royal Society of Edinburgh in 1859, and afterward in his treatise on Acupressure (1864). For twenty years he devoted himself to the subject of hospital reform, and in his leisure found time to engage in antiquarian research. In 1847 he was appointed her majesty's physician-accoucheur for Scotland; in 1856 he was made a knight of the royal order of St. Olaf of Sweden; and in 1866 a baronetcy was conferred on him.

SIMS, George Robert, journalist and dramatic writer, born 1847. He became

a contributor to *Fun* under the pen name of "Dagonet," and has written much on the London slums. His most successful dramas are *The Lights o' London*, *The Romany Rye*, and in collaboration *The Harbor Lights*, *In the Ranks*, and *London Day by Day*. He has also written novels, etc.

SINAI (si'nā), properly the general name of a mountain mass in Arabia Petræa, in the south of the peninsula of the same name, which projects into the Red sea between the gulfs of Akaba and Suez. Sometimes the name is confined to the culminating mountain of the mass, which rises 8551 feet above sea-level. The whole mass is of a triangular shape, about 70 miles long from north to south, and consists of a series of mountains, composed for the most part of granite, syenite, and porphyry, with occasional strata of sandstone and limestone, and intersected by numerous wadis or valleys. The principal peaks of the mass are *Jebel Zebir*, 8551 feet; *Jebel Katerin*, 8536 feet; *Jebel Umm Shomer*, 8449 feet; *Jebel Músá*, 7375 feet; and *Jebel Serbál*, 6734 feet. From the time of Justinian downward *Jebel Músá*, or Mount of Moses, has been almost universally regarded as the mountain of the law.

SINALOA, or **CINALOA**, a state of Mexico, bordering on the Bay of California; area, 22,630 sq. miles. The western portion of the state is sandy and barren, but the center is very fertile. The eastern division is traversed by the Mexican Cordilleras. In the fertile districts vegetation is luxuriant, the chief products being sugar, tobacco, cotton, figs, pomegranates, etc. The inhabitants are chiefly engaged in cattle-rearing and mining. Pop. 296,701.—The chief town is Culiacan. Pop. 10,380.

SIND, **SINDH**, or **SCINDE**, a province of British India, in the northern part of the presidency of Bombay. It consists of the lower valley and delta of the Indus, and is bounded on the west and northwest by Baluchistan and Afghanistan; northeast by the Punjab; east by Rajputana; and south by the Runn or Ran of Kach and the Indian ocean; area, 48,014 sq. miles. It is divided into five districts, Haidarabad, Karáchi, Shikarpur, Thar, and Parkar, and Upper Sind Frontier, and also includes the native state of Khairpur (6109 sq. miles). The chief city and port is Kurrachee or Karáchi, but the ancient capital Haidarabad is still a populous town. About 78 per cent of the population are Mohammedans; 12 per cent Hindus; 5 per cent Sikhs; and the rest Christians, Jains, Parsees, Jews, Buddhists, etc. Pop. (exclusive of Khairpur, 131,937), 3,210,910.

SINE, in trigonometry, a line drawn perpendicularly from one end of an arc of a circle upon the diameter drawn through the other end. The sine of the arc is also the sine of the angle subtended by the arc; that is, $c \sin$ is the sine of the arc $c \cap$ and the angle $c \circ \cap$.

SINGAPORE, a British possession, forming one of the Straits Settlements, and consisting of a small island, lat. $1^{\circ} 17' \text{ N.}$; lon. $103^{\circ} 50' \text{ E.}$; and its capital of the same name, with numerous surrounding islets, off the southern extremity of the Malay peninsula, and

separated from the mainland by a narrow strait 2 miles to $\frac{1}{2}$ mile in breadth. The principal island, which is undulating and well clothed with wood, is about 25 miles long and 14 miles average breadth; area, 206 sq. miles. Though so near the equator the island is remarkable for its salubrity. Cultivated products include nutmegs, cloves, ginger, pepper, sugar-cane, coffee, pine-apples and other fruits, sweet-potatoes, and other vegetables. Singapore possesses all the fruit-bearing trees of the Indian archipelago. Birds include pea-fowls, pheasants, partridges, etc. Among reptiles are turtles, tortoises, crocodiles, cobras and other serpents. The coast and rivulets abound with fish. Pop. 184,554. The town of Singapore is



situated on a rivulet on the south side of the island. It is divided into three parts—the western, inhabited by Chinese; the central, by the Europeans; and the eastern, by the Malays. Singapore is the great entrepôt of Southern Asia and the Indian archipelago, and the port is practically free. Exports consist of tin, coffee, rice, sago, tapioca, pepper, nutmegs, rattans, gambier, sugar, bees' wax, raw silk, gutta-percha, mother-of-pearl, etc. Imports from Great Britain include cottons, woollens, coals, iron, arms, wines, and various manufactures; and from Europe and the United States wines, spirits, liquors, manufactured goods, provisions, etc. Singapore is the capital of the Straits Settlements and the residence of the governor. Pop. 228,555.

SING-SING, since 1901 called Ossining, a town of the United States, on the left bank of the Hudson, sloping to a height of 200 feet, in the state and 30 miles north of the city of New York. It has a large state prison with 1320 cells, military and other schools, fine private residences, etc. There are manufactories of tools, carriages, and hardware. Pop. 10,106.

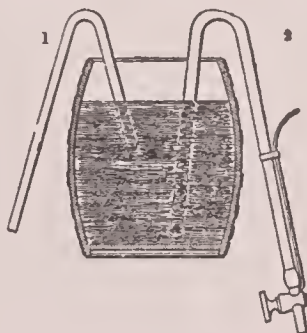
SIOUX (sō), or **DAKOTA INDIANS**, a North American family of Indian tribes dwelling chiefly in S. Dakota and Nebraska, and originally extending from Lake Winnipeg on the north to the Arkansas river on the south. They have several times engaged in hostilities with the United States settlers and troops, chiefly because faith was not kept with them by the government. In 1862 more than a thousand settlers were killed. In 1876 a body of them who had taken up a position in the Black Hills cut off General Custer and 1100 men.

SIOUX (sō) **CITY**, the county seat of Woodbury co., Iowa, 156 miles north-

west of Des Moines; on the Missouri river, at the junction of the Big Sioux and the Floyd. Among the railroads that enter the city are the Chicago, Milwaukee and St. Paul, the Chicago and Northwestern, the Chicago, St. Paul, Minneapolis and Omaha, the Illinois Central, the Great Northern, and the Union Pacific. There are large flouring and grist mills, foundries, machine shops, meat packing establishments, breweries, and large railway machine and repair shops. Pop. 1909, 62,000.

SIOUX FALLS, the county seat of Minnehaha co., S. D., 90 miles north of Sioux City, Iowa; on the Big Sioux river, here spanned by four bridges, and on the Chicago, Milwaukee and St. Paul, the Great Northern, the Illinois Central, the Chicago, St. Paul, Minneapolis and Omaha, and the Chicago, Rock Island and Pacific railroads. Pop. 12,164.

SIPHON, a bent pipe, one leg of which is longer than the other, through which a liquid may, by the action of gravity, be transferred from one place to another at a lower level over an obstruction which must be lower than a height which depends on the specific gravity of the liquid. In order to accomplish this the shorter leg is plunged into a vessel containing liquid, and the air in the tube is now exhausted by being drawn through the longer leg, whereupon the liquid will flow out of the vessel through the siphon until the surface of the liquid is brought



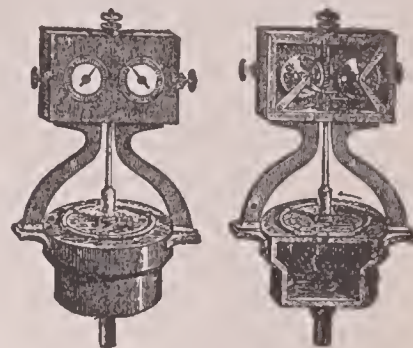
1, Common siphon. 2, Improved siphon, with exhausting tube for filling it.

down to the level of the opening of the short leg of the siphon. The water rises by the weight of the atmosphere, and the leg by which it is discharged must always be longer than the other to give a greater weight of water in this leg. Sometimes an exhaust tube is attached to the longer leg for the purpose of exhausting the air by motion and causing the flow to commence; but an equally effectual method is to put the tube with liquid and then to fill it in position while still full, the ends of course being at first stopped. The principle of the siphon has been employed in aqueducts and in drainage works. Water can be siphoned to a height of 32 feet. The principal use of the siphon is for racking wines and liquors from off their lees.

SIR, as a title, belongs to knights and baronets, and is always prefixed to the Christian name.—Sire is a term of respect by which kings are addressed. The word sir is the same as sire, and is derived from old French, senre, and that from senior, whence also seignior, signor, similar terms of courtesy.

SIREN, an instrument for producing

continuous or musical sounds, and for measuring the number of sound waves or vibrations per second, which produce a note of given pitch. In its original form it consists of a disc with a circular row of oblique holes, revolving close to the top-plate of a wind-chest perforated with corresponding holes of a contrary obliquity, so that the jets of air from the



Siren.

latter passing through the former keep the disc in motion, and produce a note corresponding to the rapidity of the coincidences of the holes in the two plates, the number of coincidences or vibrations in a given time being shown by indices which connect by toothed wheels with a screw on the axis of the disc. See also Fog-signals.

SIRENS, in Greek mythology, the name of several sea-nymphs, who by their singing fascinated those who sailed by their island, and then destroyed them. When Ulysses approached their island, which was near the coast of Sicily, he stuffed the ears of his companions with wax, while he bound himself to the mast, and so they escaped. The Sirens then threw themselves into the sea, where they became formidable rocks. Another story is that they threw themselves into the sea because vanquished in music by Orpheus.

SIRIUS, the brightest star in the heavens, also called the Dog-star, situated in the mouth of the constellation Canis Major, or the Greater Dog. It is estimated to have more than 13 times the sun's magnitude. See Dog-days.

SIROCCO, a hot, relaxing, and oppressive southeast wind, which blows in Sicily and South Italy.

SIRO'HI, a native state in the Rajputana agency, India; area, 3020 sq. miles. The country is much intersected and broken up by hills and rocky ranges, and frequently suffers from drought. Wheat and barley are the staple crops. Pop. 154,350.

SIRSA, a British district in the Punjab, India; area, 3004 sq. miles. It forms for the most part a barren and treeless plateau. A great cattle fair is held at Sirsá, the chief town, in August and September. Pop. 253,275; of town 12,292.

SISAL, or **GRASS HEMP**, a species of agave yielding a valuable fiber, a native of Mexico, Honduras, Central America, and specially cultivated in Yucatan. It is grown upon stony ground, and the leaves, from which the fiber is prepared, are between 2 and 3 feet long. The pulp

is cleaned away from each side of the leaf and the remaining fiber is then washed and sun-dried. It has considerable commercial value in the manufacture of cordage and coarse cloth.

SIS'COWET or **SISKOWIT**, a species of North American lake-trout, inhabiting chiefly the deep water of Lake Superior and other lakes.

SISMON'DI, Jean Charles Léonard Simonde de, historian and political economist, was born in Geneva, 9th May, 1773. In 1803 he published a work entitled *De la Richesse Commerciale, ou Principes d'Economie Politique appliquée à la Législation du Commerce*. This essay was afterward remodeled so as to form the groundwork of his treatise published in 1819 under the title of *Nouveaux Principes d'Economie Politique*. In 1807 appeared the first two volumes of his *Républiques Italiennes*, which ultimately reached sixteen volumes, and was not completed till 1818. In 1819 he commenced his *Histoire des Français*, a great work which was to occupy the greater part of his remaining life. He died of cancer, June 25, 1842.

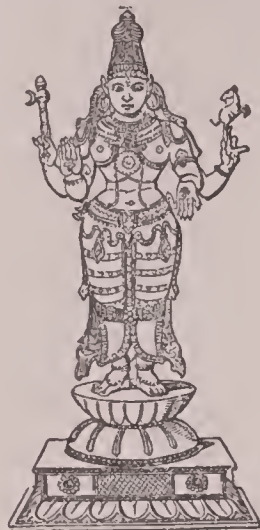
SISTERHOODS, a name given to various religious and charitable orders or associations of women. These are very numerous, and have recently increased in number. Among the more important are: (1) Sisters of Charity (also called Gray Sisters, Daughters of Charity, Sisters of St. Vincent de Paul) a Roman Catholic order founded in 1634 at Paris by St. Vincent de Paul for the work of nursing the sick in hospitals. The sisters take simple vows of poverty, chastity, and obedience, which are annually renewed; they add a fourth vow binding themselves to serve the sick. They number about 40,000 in upward of 2000 houses scattered over all parts of the civilized world. Besides nursing and conducting orphanages, the sisters sometimes undertake the management of poor schools. (2) Sisters of Charity (Irish), a congregation in no way connected with the above, founded in 1815 by Mary Frances Aitkenhead for the purpose of ministering to the sick and poor in hospitals, and at their own homes. (3) Little Sisters of the Poor, founded in France in 1840, now spread over the world. Their chief object is the care of the aged poor, and they beg from house to house. (4) Sisters of Mercy (Irish), an important and flourishing order, founded by Catherine M'Auley, Dublin, in 1827, for carrying on works of mercy both spiritual and corporal. (5) Sisters of Mercy (Anglican), an important body founded in 1845 by Dr. Pusey, the original London house being the pioneer of many charitable sisterhoods connected with the English church, and passing under various names. See Mercy (Sisters of).

SISTINE CHAPEL, a chapel in the Vatican, so called from Pope Sixtus IV., by whom it was erected in 1473. See Vatican.

SISTRUM, a kind of rattle or jingling instrument used by the ancient Egyptians in their religious ceremonies, especially in the worship of Isis. It consisted of a thin somewhat lyre-shaped metal frame through which passed loosely a

number of metal rods, to which rings were sometimes attached.

SIVA, the name of the third deity in the Hindu triad (Brahma, Vishnu, and Siva), in which he is represented as the destroyer and also as the creator or regenerator. His worshippers (the most numerous of the Brahmanic sects) are termed Saivas, and assign to him the first place in the trinity, attributing to him also many attributes which properly belong to the other deities. His symbol is the lingam or phallus, emblematic of



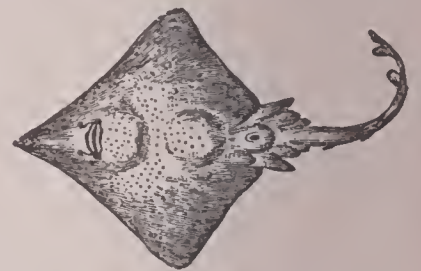
Siva.

creation. He is frequently represented riding on a white bull, with five faces and two, four, eight, or ten hands, having a third eye in the middle of his forehead pointing up and down, and carrying a trident. Serpents commonly hang about him, and he may be seen with a sort of mace in one hand and an antelope in another. See Brahmanism.

SIXTUS V. (Felix Peretti), the greatest ruler and statesman among the popes of the four last centuries, was born in 1521 near Montalto, died 1590. He entered the Franciscan order in 1534, and distinguished himself in scholastic philosophy, theology, and Latin literature. In 1544 he taught the canon law at Rimini, and two years later at Siena. In 1548 he was made priest, doctor of divinity, and superintendent of the monastic school at Siena. In 1556 he was appointed director of the Franciscan school at Venice, and afterward inquisitor-general. In 1560 he went to Rome, where the pope conferred upon him several dignities. In 1570 he was created cardinal, and took the name Montalto. Under Gregory XIII. he lived a retired life for some years in his villa, and is said to have assumed the mask of pious simplicity and old age in order to prepare himself for the papal chair. On Gregory's death in 1585 he was unanimously elected pope, and immediately manifested himself an able and energetic ruler. He restored order in the states of the church, cleared the country of bandits, and regulated the finances. He re-established discipline in the religious orders, and fixed the number of cardinals at seventy. He took a part in most of the great political events then agitating Europe. He sup-

ported Henry III. against the Huguenots, and Philip II. against England. The great aim of his foreign policy was the promotion of the cause of Roman Catholicism throughout Europe against Protestantism.

SKATE, a name popularly applied to several species of the genus of fishes *Raia* or rays. The skeleton is cartilaginous, the body much depressed, and more or less approaching to a rhomboidal form. The common skate agrees with the other members of the genus *Raia* in possessing a flat broad body, the chief portion of which is made up of the expanded pectoral fins, which are concealed, in a manner, under the skin. The tail is long and slender, and the snout pointed, with a prominent ridge or keel. The teeth are



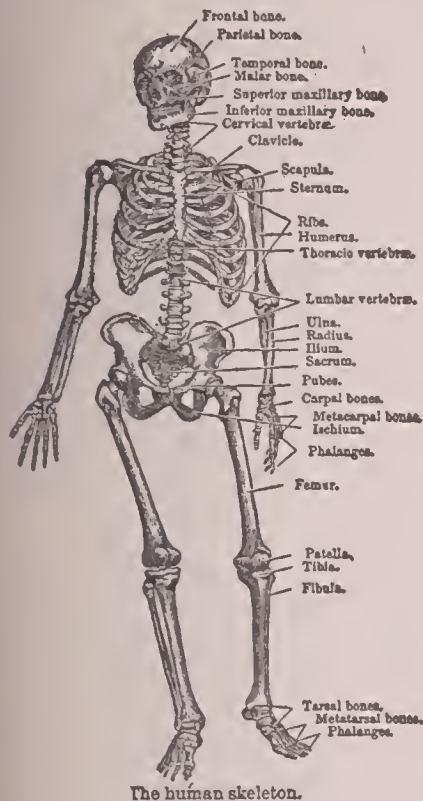
Gray skate.

arranged in a mosaic or pavement-like pattern. This fish, although commonly seen of moderate dimensions, may attain a weight of 200 lbs. or more.

SKATES and **SKATING**. A skate consists of a frame shaped somewhat like the sole of a shoe, underneath which is fastened a metallic runner, the whole being intended to be fastened one under each foot, for gliding rapidly over the ice. Skating seems to be of great antiquity, mention being made of it in the Edda. In Holland, from time immemorial, skates have been used by all classes of people upon the canals and rivers for the facility of locomotion they afford. Great variety in the manufactures of skates has been introduced within a comparatively short period. In the most improved forms the wood of the older skate has been replaced by metallic fittings, and the skate is attached to the foot by spring fastenings which obviate the need for straps. A kind of skates, termed "parlor skates" or roller skates, in which the metal runner is replaced by small wheels, is used on a prepared asphalt or other smooth flooring.

SKELETON, the name applied specially to the hard structures, mostly of bony or osseous nature, which form the internal axis or support of the soft parts in the higher or vertebrate animals. But in comparative anatomy the term endoskeleton is applied to the internal hard parts, proper to the Vertebrata, while exoskeleton denotes the exterior hard parts both of Vertebrates and Invertebrates, such as the shell of lobster, scales of fishes, etc. The parts of any endoskeleton may generally be grouped under the two heads of the spinal or axial skeleton, and the appendicular parts. The former includes the skeleton of the head and trunk, the latter that of the limbs. The spinal skeleton involves the consideration of the skull;

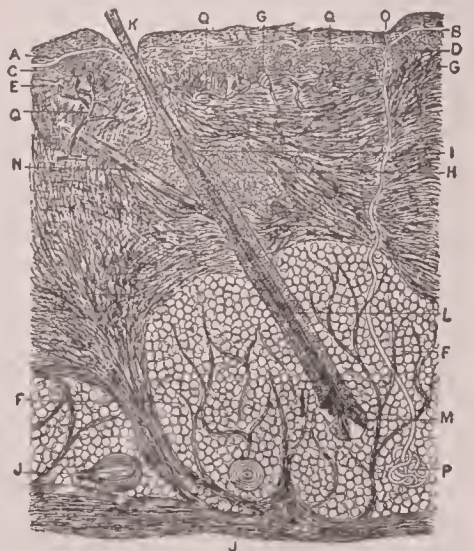
spinal or vertebral column, composed of its various vertebrae; and of the thorax, or chest, and pelvis. The limbs consist of homologous or corresponding parts, and are attached to a series of bones constituting the "arch," or support of the upper or fore and the lower or hind limbs respectively. The scapulae or shoulder-blades and collar-



bones or clavicles constitute the shoulder-girdle or arch supporting the fore or upper limb, while the lower limb is attached to the pelvic arch or pelvis. See Skull, Spine, Thorax, Rib, Shoulder, Arm, Hand, Pelvis, Leg, Foot, etc.

SKIN, the name given to the external layer or tissue of the bodies of most animals, forming at the same time a protective and a blood-purifying organ. Structurally viewed, the skin of all vertebrates consists of two layers—an outer and inner layer. To the outer layer the name of cuticle, epidermis, or scarf skin is popularly given. This layer is destitute of nerves and of blood-vessels, and is thus a non-sensitive structure. The inner layer is, on the contrary, a highly vascular and sensitive layer, and is named the dermis, corium, or true skin. At the lips and elsewhere the epidermis becomes continuous with the more delicate mucous membrane which forms the lining membrane of the internal passages. This membrane is to be viewed, however, as a mere modification of the epidermis itself. The epidermis is composed of several layers of epithelial cells. The upper cells of the epidermis, as seen in a vertical section of the skin, are flattened, and of scaly conformation, the lower cells being of rounded or elongated shape. The elongated cells have their long axes arranged vertically to the general skin surface. The deeper portion of the epidermis, or rete mucosum, is of softer and more opaque consistence and ap-

pearance than the upper layer; and it is in the rete mucosum that coloring matters are present, which give the hue to the skin. The dermis or true skin rests upon a layer of adipose and cellular tissue, and is composed of interlacing fibers of fibro-cellular tissue. It is richly supplied with blood-vessels, so that when cut it bleeds; and nerve-fibers are likewise disposed in it, conferring sensibility. The surface of the true skin is thrown into a series of elevations, papillae, or minute prominences, which are especially rich in capillary blood-vessels and nerve endings, and which are thus particularly vascular and sensitive. The special glands of the skin are the sudoriparous or sweat glands; they are in the form of tubes coiled up into balls, and the total number of them in the human skin is estimated at over two millions. There are also sebaceous glands, which secrete an oily fluid useful for lubrication. Though the most ostensible function of the skin seems to be that it covers in and protects the more delicate structures that lie beneath it, its functions as an excretory organ and as a regulator of the temperature of the body are also of high importance. The hair and nails are modifications of the epidermis, as are also the feathers of birds and the claws of animals. Extensions of skin, as between the toes of ducks, etc., or between the arms and legs of flying squirrels, and as seen in bats, may exist. And pendulous skin-folds, horns, callosities, horny plates scales, and other modifications of the epidermis, are met with in various animals. The scutes or bony plates seen in the armadillos are dermal structures united to horny plates formed by the



A, Stratum corneum; B, stratum lucidum; C, stratum granulosum; D, stratum spinosum; E, corium with papillae; F, subcutaneous fat; G, tactile corpuscles; H, sebaceous gland; I, duct of sebaceous gland; J, pacinian corpuscles; K, shaft of hair; L, root-sheath of hair; M, root of hair; N, arrector pili muscle; O, duct of sweat-gland; P, sweat-gland; Q, blood-vessels.

epidermis. In many reptiles and in some lizards the two layers of the skin similarly participate in forming the exoskeleton. The scales of fishes are formed by the dermis or true skin; but those of serpents are epidermic in their nature.

SKIN DISEASES, a name for such diseases as eczema, shingles, ringworm, pityriasis, lichen, itch, etc.

SKIN-GRAFTING, in surgery, a method for the treatment of large ulcerated surfaces by the transplantation of small pieces of skin from another part of the body.

SKINK, the common name of small lizards. They have a long body entirely covered with rounded imbricate scales, and are natives of warm climates. One species, the adda, is celebrated throughout the East as being efficacious in the



Adda or common skink.

cure of various cutaneous diseases, to which the inhabitants of Egypt, Arabia, etc., are subject. It is about 6 inches in length, has a cylindrical body and tail, and burrows in the sand.

SKIO. See Scio.

SKULL, the name applied to the skeleton of the head, composed in most vertebrates of a facial and a cranial portion, and which incloses the brain and organs of special sense. The skull of man includes twenty-two bones. In the cranial portion there are eight bones, the occipital bone o, or hinder portion of the skull, two parietal bones b, forming the sides of the head; two temporal bones d d'; the frontal bone a; the sphenoid bone c, mainly in the base of the skull; and the ethmoid bone e, between the skull and the face, and between the eye cavities. The facial portion includes fourteen bones—two



The human skull.—1, front view. 2, side view.

nasal bones g; two superior maxillary, or upper jaw-bones f; two lachrymal bones h; two molar or cheek bones e; two palate bones; two turbinated bones l m; the vomer, dividing into two the cavity of the nose j, and the inferior maxillary or lower jawbone k. This is the only bone which is movable, a hinge-joint being formed between its strong prominences at p. The left zygomatic arch is shown at r. At the base of the occipital bone is the large aperture termed the foramen magnum, through which the brain and spinal marrow become continuous. The two lesser foramina, one in either orbit, transmit the optic nerves. The size and shape of the skull vary in the different races of man, and at different ages from infancy to old age. The skulls of most vertebrata differ widely from that of man in the relative development of their various parts. See also special articles, such as Ichthyol-

ogy, Orinthology, Reptilia, etc., and also Ear, Eye, Nose, etc.

SKUNK, a carnivorous animal belonging to the weasel family. It inhabits North America, and its average size is about that of a large cat. Its fur is of a dark-brown hue, streaked longitudinally with black and white, and its tail is long and bushy. The skunk is notorious from the potent and disgusting odor which it emits from its



Common skunk.

anal glands, and which can be perceived a mile away. The secretion of these glands can be forcibly ejected at the will of the animal, and its stench is so persistent that no amount of washing will remove it from clothes impregnated with it. This nauseous secretion has been alleged to possess therapeutical virtues. The skunk is largely hunted for the sake of its fur, which is purified for commercial purposes by heat. There are two other less common species, now classed in separate genera.

SKYLARK, the skylark is found all over Europe, as well as in Northern Africa and the corresponding zones of Asia. It frequents meadows, and does not perch. It feeds chiefly on the seeds



Skylark.

of various plants and larvæ. Its nest is formed on the ground. It lays four or five eggs of a whitish gray. Its length is about 7 inches, the tail being 3. It is almost equally esteemed for the delicacy of its flesh and the melody of its song.

SLAG, a secondary product of the processes of extracting metals from their ores. It is mainly a compound of silica with alumina or lime, or both, together with various other substances in small quantity. It always contains

more or less of the metal from the extraction of which it results. The presence of silica gives a glossy appearance to the mass. Slag is sometimes cast into blocks, and used for road-making and building, and when reduced to powder it is used in making mortar and to impart a glaze to bricks. It is also utilized in the manufacture of glass. Slag phosphate meal is a fertilizer made from basic slag (which see).

SLANDER. See Libel.

SLANG, colloquial words and phrases originating for the most part in the lower classes of society. Slang is not exclusively of modern date. It was known in the classic age of Greece and Rome, and abounds in the writings of Aristophanes, Plautus, Terrence, and Martial. Slang consists in part of new words and in part of words of the legitimate language invested with new meanings. Poker players cash their "chips" at the close of the game. From this comes the use of the phrase "to pass in his chips," as slang for death. Certain words and phrases formerly regarded as strictly literary are now slang. As examples of this may be cited "awful," "fierce," "devilish," "keen," "wise," in such phrases as "an awful swell," "a fierce hat," "devilish good," "to be keen on something," or "to put a man wise to a thing." Another class is the slang of clipped words, as "enthuse," for "enthusiastic," "beaut" for "beauty," "gent" for "gentleman." All grades of society and every profession has its slang. These vary so much as to be almost or even quite mutually unintelligible. The slang of the race course, the prize ring, the barroom, and the variety show are distinct from one another. The linguistic necessity of slang is shown by its universality. It is current in all modern languages, and reaches its acme in the most highly developed tongues, as English, French, and German.

SLATE, or **CLAY-SLATE**, called sometimes argillite, a well-known hard variety of rock which splits into thin plates, the type being roofing slate. The lamination of slate is not that of its bedding, but is often at right angles to it. It is produced by lateral pressure, and is confined to disturbed and metamorphosed rock. The prevailing color is gray, of various shades; it yields to the knife, but varies considerably as respects hardness in its different varieties. Slate occurs in all countries where there are metamorphic rocks. It is commonly divided into elevated beds of various degrees of thickness; and from the natural divisions of the rock, they often form peaked and serrated mountains. The finest variety which is used for the covering of roofs is generally embedded in other slate rocks of a coarser kind. Slate-pencils are made of certain varieties of soft slate.

SLAVE COAST, a maritime strip on the west of Africa, on the Guinca Coast, extending between the Volta and Akinga, a stretch of about 240 miles. It consists mainly of long narrow islands. The principal towns on the coast are Badagry and Whydah. A large traffic in slaves was formerly carried on at the ports of this region, hence its name.

SLAVERY, the system by which cer-

tain persons are kept as the property of others, a system of great antiquity and formerly of wide prevalence. Among the Hebrews the system of slavery was one of great mildness. Native Hebrew slaves were released every seventh year, and their owners were enjoined to treat them kindly. Among the Greeks and Romans slavery was a rooted institution. At Athens the slaves were commonly treated with mildness, but at Sparta they are said to have been treated very harshly. The slaves of the ancient Romans were either captives or debtors that were unable to pay. In Rome the slave had originally no rights at all. He could be put to death for the smallest misdemeanor. Slaves were exceedingly numerous, and latterly almost monopolized all the various handicrafts and occupations, those of the clerk, the doctor, and the literary man included. In the time of Augustus a single person is said to have left at his death over 4000 slaves. Hosts of slaves were employed in the gladiatorial exhibitions. Slaves, however, were often set at liberty, and these freedmen were a well-known class at Rome. But it was not till the time of the empire that any great change took place in the condition of the slaves. Augustus granted the slave a legal status, and Antonius took away from the masters the power of life and death over their slaves. The early Christian church did nothing to suppress slavery, and slavery and the slave-trade continued to exist for 1000 years in the Christian nations of Europe that rose on the ruins of the Roman empire. It was not till the 13th century that the severity of slavery began to decline in Europe. The Koran expressly permits the Moslems to acquire slaves by conquest, but this method of acquiring slaves was not resorted to until the Crusades. Previous to the Crusades they kept negro slaves imported from Africa. Latterly the Mohammedans began to obtain white slaves not only by war but also by purchase, Rome being the center of the trade. The Mohammedans of the Barbary states also obtained white slaves by piracy in the Mediterranean.

After slavery had become all but extinct in Europe, it had a new birth in the American colonies of European origin. The Portuguese were the first to hunt negroes in the interior of Africa for use as slaves in the colonies. The first shipment of negroes to the New World took place in 1503, when the Portuguese landed some in St. Domingo. From that time to the nineteenth century a traffic in negroes across the Atlantic was carried on by all the Christian colonial powers. In 1562 the English first took part in the trade, and in course of time outdid all other nations in the extent to which they carried this traffic, as also, it is said, in the cruelty with which they conducted it. About 1770 nearly 200 English vessels were engaged in the trade.

The first persons who liberated their slaves, and labored to effect the abolition of the slave-trade, were some Quakers in England and North America early in the 18th century. In 1783 a petition was addressed to parliament for the

abolition of the trade, which Wilberforce eloquently supported. A bill passed the House of Commons for the abolition of the slave-trade in 1792, but it was rejected by the lords. On February 4, 1794, the French national convention declared all the slaves in the French colonies free. Wilberforce brought in a bill with a like object in 1796, but it was rejected. In March 1807, the famous Abolition Act was passed. January 1, 1808, was fixed as the time when this trade, on the part of the British should cease. The abolition of slavery itself gradually followed that of the trade in slaves. In 1831 the British government emancipated all the slaves of the crown, and in 1833 a bill was passed for the emancipation of all the slaves in British colonies. The greatest slave-holding nation till recent times was the United States, in which, however, slavery was only an institution of the Southern states. As a result of the civil war it was abolished by proclamation in 1863, and by constitutional amendment in 1865. In 1873 the Spanish government abolished slavery in Porto Rico, and in 1886 abolition in Cuba took place. In Brazil slavery existed till 1888.

The efforts made to suppress the slave-trade on the east coast of Africa have not hitherto proved quite successful. In 1817 a treaty for its suppression was concluded with Madagascar, and in 1822 with the Imam of Muscat (ruler of Oman); but the slave-trade was, until recently, as active as ever along the whole coast. Those chiefly engaged in the trade are Arabs, who sell the slaves in the African countries bordering on the Mediterranean and at the ports of the Red sea. They are all ultimately destined for Mohammedan masters. The suppression of the trade was one of the objects of Sir Samel Baker's expedition up the Nile in 1870-73; and much more vigorous and effective measures were carried out by General Gordon in 1877 and subsequent years. In May, 1873, a treaty was signed stipulating for its suppression within the dominions of the Sultan of Zanzibar; and the slave-market at Zanzibar was thereupon closed. At the present time, through the extension of the influence of Britain and other European powers, the traffic has been put down in many districts where it was formerly rampant.

SLAVES, SLAVS, or SLAVONIANS, a branch of the Aryan family of nations, among which it is most nearly allied to the Lithuanian and more distantly to the Germanic branch. In the 4th century Slavs lived in great numbers in the neighborhood of the Carpathians, and hence they appear to have spread northward to the Baltic and south to the Adriatic. About the beginning of the 6th century they are found on the northern banks of the Lower Danube, whence they passed over to the southern banks, occupying Moesia and Thrace; at this time Slavs also peopled Bohemia and Moravia, and before the end of the century they had penetrated into Transylvania, Hungary, Upper Austria, Styria, Carinthia, and Carniola. The Slavonic tribes of Chorvatiens (Croats) and Servians settled probably between 634

and 638 in Dalmatia and the whole of ancient Illyricum (Bosnia, Servia, and the neighboring districts). Finally, Slavonic tribes spread from their first settlements also to the north and east, over the remainder of modern Russia. Of this wide territory the Slavonians again lost in process of time the Elbe and Oder regions, Upper Austria, and part of Carinthia and Styria, all of which they were deprived by Germanic tribes; large parts of Transylvania and Hungary, which fell to Roumanians and Magyars; and parts of the regions on the south of the Danube, which came into the hands of Greeks and Turks.

The Slaves in the districts in which they still exist form two great groups, the southeastern and the western Slaves. The former include (1) Bulgarians, (2) Servians, (3) Croats, (4) Slovenians, (5) Russians; and the latter include (1) Czechs (comprehending Czechs in the narrower application, Moravians, and Slovaks); (2) Sorbs (Lusatians), divided into Upper and Lower Sorbs; and (3) Poles. The total number of Slaves is said to be about 116,000,000, five-eighths of whom are Russians. With few exceptions the Russian and Bulgarian Slaves belong to the Greek church, the western Slaves mostly to the Roman Catholic. There are eleven different Slavonic literary dialects. The four principal dialects and literatures are the Czech or Bohemian, the Polish, Russian and Servian.

SLAVONIA, a region of Austria-Hungary, which with Croatia and the Military Frontiers forms a province or administrative division of the empire; area of Slavonia, 3720 sq. miles. Pop. 377,613.

SLEDGE, a vehicle moved on runners or on low wheels, or without wheels, for the conveyance of loads over frozen snow or ice, or over the bare ground; called also a sled. Also a kind of traveling carriage mounted on runners, otherwise called a sleigh; much used in Russia, America, and other northern countries during winter, instead of wheel carriages.

SLEEP, the state in which the activity of the senses and cerebrum or brain proper appears to be naturally and temporarily suspended. This state is consistent with a kind of passive activity of these nervous centers, as seen in the acts or phenomena of dreaming, as well as in other concomitant phenomena of sleep. All parts of the body which are the seat of active change require periods of rest. In the case of the brain it would be impossible that there should be short periods of activity and repose, that is, of consciousness and unconsciousness, hence the necessity of sleep, a condition which is an unusually perfect example of what occurs at varying intervals in every actively working portion of our bodies. Sleep, therefore, affords the interval during which nervous energy expended during the waking hours is renewed. The respective influences of habit, age, temperament and occupation have much to do with the induction and maintenance of sleep in different individuals. An abnormal condition of irritability caused by great mental effort or strain for a considerable time,

frequently results in preventing the access of sleep when it is desired. This indicates a revolt of the nervous centers, which may prove dangerous if the cause of it be not speedily done away with. Sleep often occurs in very different degrees in different parts of the nervous system. The phenomena of dreams and somnambulism are examples of differing degrees of sleep in different parts of the cerebro-spinal nervous system. Physiologists are all agreed that the dreamless sleep is the most refreshing, the lighter sleeper being liable to be disturbed by the most trifling noises. In some cases of diseased conditions sleep may be prolonged for indefinite periods, although obviously the distinction between coma and sleep is only made with great difficulty in such cases; while, on the contrary, periods of active wakefulness may occur and extend for days, weeks, or even months, without a single interval of sleep or repose. Insensibility is equally produced by a deficient and an excessive quantity of blood within the cranium; but it was once supposed that the latter offered the truest analogy to the normal condition of the brain in sleep, and, in the absence of any proof to the contrary, the brain was said to be during sleep congested. Direct experimental inquiry has led, however, to the opposite conclusion. The condition of the brain during sleep is one of considerable bloodlessness. There seems to be both a diminished quantity of blood circulation through the brain, and the speed of its movement is much lessened. See Dreams, Somnambulism.

SLIDELL, John, American politician, born in New York City in 1793. In December, 1853, he became United States senator, but resigned upon the secession of Louisiana from the Union. As commissioner to France he, with James M. Mason, commissioner to England, embarked upon the British mail steamer Trent, which was overhauled on November 8th by the United States sloop San Jacinto, and they were arrested and confined for a time in Fort Warren, Boston. Upon the demand of England the act of Captain Wilkes was disavowed and the commissioners sailed for England January 1, 1862. Mr. Slidell failed in his mission to France and at the close of the war settled in England. He died in 1871.

SLIDE-VALVE, a contrivance extensively employed in regulating the admission or escape of steam or water in machinery. A familiar example of the slide-valve is found in the ordinary steam-valve of a steam-engine.

SLIDING-RULE, a mathematical instrument or scale, consisting of two parts, one of which slides along the other, and each having certain sets of numbers engraved on it, so arranged that when a given number on the one scale is brought to coincide with a given number on the other, the product or some other function of the two numbers is obtained by inspection. The numbers may be adapted to answer various purposes, but the instrument is chiefly used in gauging and for the measuring of timber.

SLIGO, a seaport town of Ireland, prov. Connaught, capital of county

Sligo, 134 miles n.w. of Dublin. Sligo was disfranchised in 1870. Pop. 10,870. —The county is bounded n. by the Atlantic, e. by Leitrim, s. by Roscommon and Mayo, and w. by Mayo; area, 461,796 acres, of which about 320,000 acres are cultivated. The principal crops are oats and potatoes. Coarse woolens and linens are manufactured for home use. The coast fisheries are extensive. Pop. 84,022.

SLING, an instrument for throwing stones or bullets, consisting of a strap and two strings attached to it. The velocity with which the projectile is discharged is the same as that with which it is whirled round in a circle, having the string for its radius. The sling was a very general instrument of war among the ancients. With a sling and a stone David killed Goliath. The name is also given to a kind of hanging bandage in which a wounded limb is sustained; and to a device for holding heavy articles, as casks, bales, etc., securely while being raised or lowered.

SLIPS, Propagation by, a mode of propagating plants, which consists in separating a young branch from the parent stock, and planting it in the ground. Slips from trees of which the wood is white and light, such as willow, poplar, or lime, succeed best. A slip succeeds more certainly when two or three young buds are left on the lower part of it under ground.

SLOANE, Sir Hans, a distinguished naturalist, and founder of the British museum, was born in the north of Ireland, in 1660; died at Chelsea 1753. His *Natural History of Jamaica* (1707–25) was the result of his observations at that island during a visit in 1687–89. George I. created him a baronet and physician-general to the forces in 1716, and on the accession of George II. he was named physician in ordinary to his majesty.

SLOE, or **BLACKTHORN**, a well-known deciduous shrub of the plum genus with spinose branches, and pos-

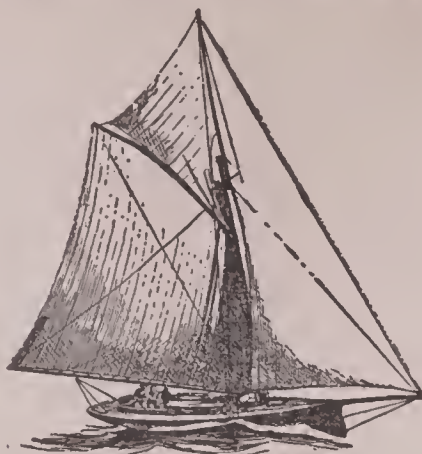


Flower and fruit of sloe.

sessing a very hard, tough wood. It blossoms with white flowers in the early spring, and has a black, round, austere fruit which is used for preserves, for making a fictitious port wine, and for dyeing black. The sloe is from 8 to 15 feet high. There are two or three varieties, including a double-flowered, variegated-leaved, and egg-shaped fruited forms.

SLOOP, a small vessel furnished with one mast and a fixed bowsprit. It is fore-and-aft rigged, and usually carries a main-sail, fore-sail (jib-shaped,) a jib, and a gaff-sail. It is a common rig for

yachts. A sloop-of-war, was formerly a vessel, of whatever rig, between a corvette and a gunboat, carrying from ten to eighteen guns. The name is still



Sloop.

retained for certain vessels of no great size or fighting power.

SLOTH, the name applied to several genera of edentate mammalia inhabiting south and central America, and forming the family *Bradypodidae*. This family is distinguished by the flat short head, and by the elongated legs, furnished with powerful claws of compressed and curved shape. No incisor-teeth exist, but simple molars are developed. The stomach is of somewhat complex nature. The fore-limbs are longer than the hind-limbs, and have a powerful muscular organization. The palms and soles of the feet are turned inward, and the claws are bent inward toward the soles, so that the sloth's movements on the ground are both awkward and painful; but in their natural habitat amid the trees, the curved and inwardly-disposed claws and limbs are seen to be admirably adapted for locomotion in their characteristic fashion, back downward, through their native forests. Of the sloths the best-known species has three toes and is of a brownish-gray color, with darker tints on the face and limbs. The fur is of very coarse character.

SLOVAKS, the name of the Slavonian inhabitants of Northern Hungary, also found in Moravia in the districts adjoining Hungary, and in detached settlements in Lower Austria, Bukowina, and Slavonia. The total number of Slovaks is under 2,000,000.

SLOYD, **SLOJD** (a Scandinavian word equivalent to the English sleight), a system of manual training for pupils in elementary and higher schools, in which the pupils are accustomed to the use of tools in a handicraft, which is not necessarily intended to form their future exclusive or main occupation. It is applied to any useful handiwork such as carpentry, metal-work, basket-work, fret-work, book-binding, etc., but is usually confined to wood-sloyd, or the use of the knife and carpenter's tools. It is already practically introduced into America under the name of manual training.

SLUG, the name applied to several genera of molluscs, included in the pulmoniferous (or "lung-bearing") sec-

tion of the class, and resembling the snails, but not having an external shell. The typical slugs possess a rudimentary shell, internal in its nature, and generally concealed more or less completely by the mantle. The body is elongated, depressed, and attenuated backward, the head and tentacles retractile. The latter are four in number, the eyes being borne on the tips of the larger pair. Of this genus the great gray slug and the black slug are the two familiar species. The former usually frequents hollow trees, undisturbed heaps of decaying vegetable matter, and like situations. The black slug is more common than the gray species, and is usually of smaller size. Other familiar genera are the red slug; and the *Testacella*, represented by the little carnivorous species which feed chiefly upon earthworms, and is generally found in the loose soil of gardens.

SLUR, in music, a sign in the form of a curve, placed over two or more notes on different degrees, to indicate that they are to be played legato.

SMACK, a small vessel rigged as a cutter, sloop, or yawl, used in the coasting trade and in fishing.

SMALL-ARMS, a general name for all portable fire-arms. (See Musket, Rifle, Revolver, etc.) The name of small-arms factories is given to certain government establishments for the manufacture of small-arms. The different parts of the rifles are made so accurately on the same model that a part belonging to any one of the rifles manufactured will do equally well for any other.

SMALL-POX, an infectious disease, characterized by a pustular eruption accompanied by high fever. The first symptoms of the disease appear about seven days after infection, when a feverish shivering pervades the body, followed about three days later by the appearance of red spots on the face, breast, hands, and gradually over the whole body. After about three days these spots develop pustules, which become inflamed and suppurate. About the eleventh day the pustules begin to dry up and form a crust. Commonly the small-pox virus infects but once, and then only those persons who have a certain susceptibility for it. This disease is first mentioned by Arabic writers. It is not certain how it was introduced into Europe, but from the 13th century downward it raged with great destructiveness among the western nations, until it was checked by the introduction of vaccination. It is more fatal on its first appearance in a country, and commits greater ravages, than after having prevailed for some time, as it did in Iceland in 1707, and in Greenland in 1733. The violence of the disorder is lessened when it is produced artificially by inoculation with the small-pox virus. Inoculation was introduced into Western Europe from Turkey by the celebrated Lady Montagu; but it has been entirely superseded by vaccination, which is safer. See Vaccination.

SMELL, the sense exercised in the perception of odors, through the functions of the olfactory nerves. The sense is one of the special senses in that the nerves devoted to the appreciation of

SMELLIE

odors exercise that function alone, and are not affected by any other kind of impressions; while again, no nerves are capable of receiving the particular impressions of odors but the olfactory filaments. The sense of smell is derived exclusively through those parts of the nasal cavities in which the olfactory nerves are distributed. (See Nose.) The matters of odor must in all cases be dissolved in the mucus of the mucous membrane before they can be immediately applied to or affect the olfactory nerves; thus for the perception of odors the mucous membrane of the nasal cavity must be moist. In animals living in the air it is also requisite that the odorous matter should be transmitted in a current through the nostrils. This is effected by an inspiratory movement, the mouth being closed. The voluntary nature of the act of smelling is also thus exemplified, since by interrupting the respiration or breathing, the sense cannot be duly exercised. The delicacy of the sense of smell is most remarkable; it can discern the presence of bodies so minute as to be undiscoverable even by spectrum analysis; *100,000,000* of a grain of musk can be distinctly smelt. The olfactory nerves form the first pair of cranial nerves, or those given off directly from the brain as a center. The facility with which different odors are perceived varies in different animals. Thus carnivorous mammalia are most susceptible to the odors of other animals than herbivorous forms; and the latter in their turn are more readily affected by the smell of plants. Although the sense of smell in man is less acute than that of many animals, yet his sphere of susceptibility to various odors is more uniform and extended. The influence of habit is very marked in the exercise of this sense, custom enabling the individual to inhale odors which at first might be distasteful or nauseous to him. Certain diseases of the brain may produce anomalous effects on the olfactory sense.

SMELLIE, William, naturalist and general writer, born at Edinburgh about 1740, died there in 1795. In 1765 he compiled and conducted the first editions of the *Encyclopædia Britannica*, which began to be published in numbers at Edinburgh in 1771, and was completed in three vols., quarto. In 1780 he gave to the world the first part of his *Translation of Buffon's Natural History*.

SMELT, a small but delicious European fish, allied to the salmon, inhabiting the salt water about the mouth of

called also the sperling, or sparling. The American smelt inhabits the coasts of New England; but the name is given in America also to other fishes. The name of sand smelt is given to a small fish allied to the mullets and climbing perches. It averages about 6 inches in length, and is of a pale pink color, with black spots on the head and back.

SMELTING, the process by which a metal is obtained from its ore in a melted state by applying great heat. Iron is smelted in lofty furnaces known as blast-furnaces.

SMEW, a swimming bird of shy habits. It flies well, but has an awkward gait on land. Its average length is from 15 to 18 inches. The head, chin, neck, and under parts of the male are white; the back is black, the wings black and



Smew, adult male.

white; the back of the head bears a crest of elongated feathers. The plumage of the female is reddish brown mixed with gray tints.

SMILACEÆ, a natural order of endogenous plants, belonging to the subclass *Dietyogenæ*, or those having reticulated leaves. They are mostly climbing plants, with woody stems and small unisexual flowers. They are found in small quantities in most parts of the world except in Africa. The genus *Smilax* embraces the various species of sarsaparilla.

SMILES, Samuel, LL.D., was born at Haddington, Scotland, in 1812. He is the author of many works on industrial enterprise, the chief of which are: *Life of George Stephenson*, *Self-Help*, *Character*, *Thrift*, *Self-Effort* and *Duty*. These works are characterized by their good moral teaching; they are written in a clear and simple style, and many of them have been translated into various European languages. The University of Edinburgh conferred the degree of LL.D. on Smiles in 1878. He died in 1904.

SMITH, Adam, a distinguished writer on political economy and on morals, was born June 5, 1732. His first publication, *The Theory of Moral Sentiments*, appeared in 1759, and was most favorably received. His theory makes sympathy the foundation of all our moral sentiments. To this work he afterward added an *Essay on the Origin of Languages*. In 1766 he retired with his mother to Kirkealdy, where, after ten years of close study, he wrote his celebrated *Inquiry into the Nature and Causes of the Wealth of Nations*. This work may be deemed the formal precursor of the modern science of economics. He died in July, 1790.

SMITH

SMITH, Charles Emory, American journalist and politician, was born at Mansfield, Conn., in 1842. In 1865 he became editor of the *Albany Express*, and several years later of the *Evening Post*. He removed to Philadelphia in 1880, and became editor of the *Press*.



Adam Smith.

From 1890 till 1892 he was American minister to Russia. From 1898 till 1902 he was postmaster-general of the United States. Rural mail routes were established during his administration. He died in 1908.

SMITH, Charles Henry, American humorist, was born at Lawrenceville, Ga., in 1826; served in the confederate army and after the war was a planter and took some interest in politics. He was widely known for his newspaper letters, under the signature "Bill Arp," which began in 1861, and with their homely, genuine humor cheered the hearts of the southern people. The letters were subsequently collected as *Bill Arp's Letters*, to which were added *Bill Arp's Scrap Book* and other volumes. He died in 1903.

SMITH, Francis Hopkinson, American artist and author, was born in Baltimore, Md., in 1838. Some of his best known pictures are: "The Old Man of the Mountains," "In the Darkling Wood," "Peggothy on the Harlem," "A January Thaw." His work in charcoal and as an illustrator is of a high quality. His fame as an author has almost eclipsed that of the artist. Among his works are: *Well-Worn Roads*, *Colonel Carter of Cartersville*, *A Gentleman Vagabond* and *Some Others*, *Tom Grogan*, *Caleb West*, *Master Driver*, *The Fortunes of Oliver Horn*, and *The Under Dog*.

SMITH, George, assyriologist, born about 1840. In 1872 he made known his striking discovery of a series of tablets in the British museum containing, among other records, the Babylonian legend of the flood. He died in 1876.

SMITH, Goldwin, English historical writer, born at Reading, Berks, in 1823. He was appointed member of the senate of the University of Toronto in 1871, where he has ever since resided. Among his chief works are: *Lectures on Modern History*, *Three English Statesmen* (Pym, Cromwell, and Pitt), *The United States*, *The United Kingdom*.

SMITH, Green Clay, American soldier, was born at Richmond, Ky., in 1832. He served through the Mexican war as lieutenant in a Kentucky regiment. In 1860 he was elected to the Kentucky



Smelt.

rivers. It is of a silvery-white color, the head and body being semi-transparent, and is from 4 to 8 inches long. It inhabits fresh water from August to May, and after spawning returns to the sea. When first taken out of the water smelts have a strong smell of cucumber. It is

legislature. On the outbreak of hostilities he recruited and became colonel of the Fourth Kentucky cavalry (federal), took part in the Tennessee campaigns of 1862, and in June of that year was commissioned brigadier-general of volunteers. In 1863 he was elected to the thirty-eighth congress. He was re-elected to congress in 1864 and in 1866 was appointed by President Johnson governor of Montana territory. In 1876 he was the candidate of the prohibition party for the presidency. He died in 1895.

SMITH, John (commonly known as Captain John Smith), one of the founders of the English colony in Virginia, was born at Willoughby in Lincolnshire in 1580. After many adventures as a soldier of fortune in Europe, Asia, and Africa, he joined in the project to colonize Virginia. The first expedition left London in 1606. He made important geographical discoveries, obtained supplies from the natives, and was finally intrusted with the guidance of the colony. For a time he was a prisoner among the Indians; but the story of Pocahontas connected with this seems to be, like others of Smith's adventures, undeserving of credibility. He died in 1631.

SMITH, Joseph, Mormon leader, born in Sharon, Vt., December 23, 1805; died in Carthage, Ill., June 27, 1844. In 1823 he pretended to have had visions and interviews with angels, by whom the book of Mormon was revealed to him. This volume was eventually published at Palmyra, N. Y., in 1830. A Mormon church was established on April 6th of that year in Fayette, N. Y. The Mormons later wandered to Illinois. Subsequently Smith was chosen mayor and sole trustee of the Mormon church, with unlimited powers; a military organization of 1500 men was formed, called the "Nauvoo Legion," and Smith was appointed lieutenant-general. Missionaries sent to England brought large accessions of members, and the erection of a new temple attracted others. Driven from Missouri on the ground of forming polygamy, Smith as mayor of Nauvoo, Ill., and head of the Nauvoo Legion, was accused of attempting to found a military church. He was indicted for perjury and adultery and was murdered in Carthage jail on June 27, 1844. He was succeeded in the presidency of the church by Brigham Young.

SMITH, Samuel Francis, American clergyman and hymn writer, was born in Boston in 1808. From 1842 to 1848 he was editor of *The Christian Review*, and of the publications of the American Baptist Missionary Union. He wrote "My Country, 'Tis of Thee," "The Morning Light Is Breaking," and other favorite hymns. He died in 1895.

SMITH, Sydney, English clergyman, noted for his wit and humor, was born at Woodford, Essex, in 1771; died in 1845. He was one of the founders in 1802 of the *Edinburgh Review*, being also one of its most influential contributors. In 1831, during the ministry of Earl Grey, he became one of the canons of St. Paul's, London, where he henceforth resided. A few years before his death a collected edition of his

writings was published under his own supervision, including papers contributed to the *Edinburgh Review*, *Sketches of Moral Philosophy*, etc.

SMITH, Thomas Southwood, M. D., physician and sanitary reformer, was born at Martock, Somersetshire, in 1778. In 1825 he was appointed physician to the London Fever Hospital. He published in 1830 a *Treatise on Fever*, the best work on the subject that has ever been written. His reports led to the passage of the Factory Act; to the exclusion of women and children from mines; to the Public Health Act, etc. He died in 1861.

SMITH, William, the "father of English geology," born at Churchill, in Oxfordshire, in 1769; died at Northampton in 1839. He became convinced that each stratum contained its own peculiar fossils, and might be discriminated by them, and in 1815 he was able to submit a complete colored map of the strata of England and Wales to the Society of Arts.

SMITH, Sir William, LL.D., D.C.L., English scholar, born in London in 1813, died 1893. He edited the well-known series of Classical, Biblical, and Ecclesiastical Dictionaries, and wrote or edited many educational books. He was for some time classical examiner in London university. From 1867 he was editor of the *Quarterly Review*. He was knighted in 1892.

SMITH, William Henry, was born in London in 1825. From 1868 to 1885 he represented Westminster, when, after the Redistribution Bill, he was returned for the Strand, for which division he was member till his death in 1891. Mr. Smith was financial secretary to the treasury (1874-77), first lord of the admiralty (1877-80), secretary for war (1885). In 1886, on the resignation of Lord Randolph Churchill, Mr. Smith vacated the war office, and assumed the leadership of the House of Commons as first lord of the treasury.

SMITH, William Robertson, biblical scholar, was born at Keig, Aberdeenshire, in 1846. From 1881 Professor Smith was connected with the editorship of the *Encyclopædia Britannica*, and after the death of Professor Baynes was editor-in-chief. He was a member of the Old Testament revision committee, in 1879-80. He is the author, among other works, of *The Old Testament in the Jewish Church*, *The Prophets of Israel and their Place in History to the Close of the 8th Century B.C.*, *Kinship and Marriage in Early Arabia*, and *Religion of the Semites*. He died in 1894.

SMITH, Admiral Sir William Sidney, born in Westminster in 1765, died in 1841. He entered the navy at the age of twelve, received his lieutenantancy at sixteen, and when nineteen was created post-captain. He was created rear-admiral of the blue in 1805, and in 1806 inflicted signal injuries on the French off the coast of Naples. In 1807 he distinguished himself by the destruction of a Turkish squadron. He was made vice-admiral in 1810, admiral in 1821, and in 1830 succeeded King William IV. as lieutenant-general of marines.

SMITHSON, James, philanthropist, born in England about 1754; died in Genoa, Italy, June 27, 1829. He was a natural son of the duke of Northumberland. In 1786 he was graduated at Oxford. He spent much time in traveling on the European continent, engaged in scientific observations, carrying with him a portable laboratory, and formed a large collection of gems and minerals. Mr. Smithson was a member of the Royal Society of England, and of the French Institute. He bequeathed his property, about \$600,000 for the purpose of founding an institution at Washington to be called the Smithsonian institution for the increase and diffusion of knowledge among men. In 1846 this institution was founded. (See following article.)

SMITHSONIAN INSTITUTION, a scientific institute in Washington, organized by act of congress in 1846, to carry into effect the provisions of the will of James Smithson, the founder. He died at Genoa in 1829, leaving his property to his nephew, with the condition that if the latter died without issue the property was to go to the United States to found an establishment for the increase and diffusion of knowledge. In 1835 the nephew died childless, and in 1838 the sum of 515,169 dollars was paid to the treasury of the United States. In 1846 the interest on this sum (the principal itself must remain untouched) was applied to the erection of a suitable building, with apartments for the reception and arrangement of objects of natural history, including a geological and mineralogical cabinet, a chemical laboratory, a library, a gallery of art, and the necessary lecture-rooms. The building is one of the largest in Washington. A portion of the funds of the institution is devoted to scientific researches and the publication of works too expensive for private enterprise. Three series of publications are issued: *Contributions to Knowledge*, *Miscellaneous Collections*, and *Annual Reports*. The building contains the National museum, which is, however, wholly maintained by the government. The institution is administered by regents, composed of the chief-justice of the United States, three members of the senate and three of the house of representatives, with six other persons, not members of congress. The president vice-president, and members of the cabinet for the time being have the positions of governors or visitors of the institution, the president being ex-officio at the head.

SMOKE, the exhalation or visible vapor that arises from a substance burning. In its more extended sense the word smoke is applied to all the volatile products of combustion, which consist of gaseous exhalations charged with minute portions of carbonaceous matter or soot; but, as often used in reference to what are called smoke-consuming furnaces, the term is frequently employed to express merely the carbonaceous matter which is held in suspension by the gases. There are many practical difficulties in the way of consuming smoke, but experience has shown that none of them are insuperable. The prin-

ciple involved is that of mixing air with the combustible vapors and gases generated, by the action of heat on the fuel so that by virtue of a due supply of oxygen they may be made to burn with flame, and become entirely converted into incombustible and invisible vapors and gases.

SMOKELESS POWDER, an explosive substance that burns without making much smoke, used chiefly for military purposes. The use of smokeless powder began with the invention of poudre B. in France in 1886. They are divided into three classes, as follows: (1) Powders in which guncotton, either the insoluble or the soluble variety alone, is used, which, by the aid of a solvent, has been converted into a horny substance and then is formed into flakes or cords; (2) powders in which a mixture of nitro-glycerin and either dinitro- or trinitro-cellulose is transformed into a similar horn-like substance, either with or without the aid of a solvent; and (3) powders that contain nitro-derivatives of the aromatic hydro-carbons, either by themselves or in connection with nitro-cellulose.

Some of the various smokeless powders are: Ballistite, cordite, Du Pont powder, indurite, cibalite, poudre J., poudre pyroxyée, Troisdorf, Von Förster, Walsrode, and Wetteren powders.

SMOLENSK', a government in Russia, west of Moscow; area, 21,547 sq. miles. Pop. 1,551,068. The climate, though cold, is healthy, and the soil tolerably fertile, producing good crops of rye, hemp, and flax, hops and tobacco. The pastures are excellent, and the forests yield excellent timber.—Smolensk, the capital, is situated on the Dnieper, 250 miles w.s.w. of Moscow. Pop. 46,889.

SMOL'LETT, Tobias George, novelist and miscellaneous writer, was born near Renton in Dumbartonshire in 1721; died at Monte Nuovo, near Leghorn, 1771. In 1748 he published his *Adventures of Roderick Random*, a novel which brought him both fame and fortune. He went to Paris in 1750, and about this time wrote his *Adventures of Peregrine Pickle*, which appeared in 1751. In 1755 he brought out a new translation of *Don Quixote*. Soon after this he was induced to take the chief management of the Tory organ, the *Critical Review*. In 1757 he produced *The Reprisal*, a comedy in two acts, which proved a success. In 1758 appeared his *History of England*, from Julius Cæsar to the Treaty of Aix-la-Chapelle in 1748. In 1761, 1762, and 1765 appeared his *Continuation of the History of England* down to 1765, since often reprinted as a continuation of Hume's *History*. In 1770 he wrote his *Humphry Clinker*, which is regarded as the best of all his works. The humor of Smollett is of the broad full-flavored kind, not seldom degenerating into burlesque; his characters are well marked and varied; and though his work is frequently coarse and vulgar, it has had much influence on English fiction.

SMUT, a disease, also called *Dust-brand*, incidental to cultivated corn, by which the farina of the grain, together with its proper integuments, and even part of the husk, is converted into a

black, soot-like powder. It does not affect the whole body of the crop. Some attribute the smut to the richness of the soil, and others consider it as a hereditary disease transmitted by one generation to another through the seed. It is produced by a minute fungus. The safest mode for the farmer to pursue to prevent smut, is never to sow grain from a field in which the smut has prevailed.

SMYRNA, an ancient city and seaport of Asiatic Turkey, on the west coast of Asia Minor, at the head of the gulf of the same name. Smyrna has been for centuries the most important place of trade in Asia Minor. The chief imports are cotton manufactures, woolen cloths, colonial goods, iron, steel, and hardware goods. The principal exports are dried fruits (especially figs), cotton, silk, goats'-hair, sheep and camels' wool,



valonia, madder-root, yellow-berries, sponges, and opium. The origin of Smyrna is lost in antiquity. It laid claim to the honor of being the birth-place of Homer, and no doubt was a Greek city as early as the date assigned to the poet. It early received Christianity, and was one of the "seven churches" of Asia. In the 13th century only the ruins of its former splendor were left; but after the Turks became masters of the country it revived. It has repeatedly suffered from earthquake. Pop. estimated at 200,000.

SMYRNA, Gulf of, formerly the Hermaean gulf, an inlet of the Aegean sea on the coast of Asiatic Turkey, so called from the town of Smyrna, which stands at its head. It is 40 miles in length by 20 at its broadest part, and contains several islands and affords good anchorage.

SNAIL, a slimy, slow-creeping, air-breathing mollusc differing from the slugs chiefly in having a spiral shell. The head is furnished with four retractile horns or tentacles; and on the superior pair, at the extremity, the eyes are placed. The sexes are united in the same individual, but the union of two such hermaphrodite individuals is necessary for fertilization. The common garden snail is the most familiar species of the typical genus. The mischief done by it to garden produce on which it feeds is very extensive. Nearly equally well known is the edible snail, largely found in France, and cultivated there and elsewhere for food purposes.

SNAKE, a name equivalent to serpent.

(See Serpents.) It is applied especially to the common harmless ringed-snake. **SNAKE INDIANS**. See Shoshones.

SNAKEROOT, the popular name of numerous American plants of different species and genera, most of which are, or formerly were, reputed to be efficacious as remedies for snake bites.

SNAKE-STONE, a popular name of those fossils otherwise called Ammonites. The name is also given to certain small rounded pieces of stone or other hard substance, popularly believed to be efficacious in curing snake bites.

SNAPPING-TURTLE, a species of fresh water tortoise common to all parts of the United States. It feeds on small animals, is bold and fierce, and is so named from its propensity to snap at



Snapping-turtle.

everything within its reach. Another tortoise of similar habits, but larger (sometimes weighing 100 lbs.), receives the same name.

SNEEZING is a convulsive action of the respiratory organs brought on commonly by irritation of the nostrils. It is preceded by a deep inspiration, which fills the lungs and then forces the air violently through the nose. Sneezing produced in the ordinary way is a natural and healthy action, throwing automatically from the delicate membrane of the nostrils whatever irritable or offensive material may chance to be lodged there. When it becomes violent, recourse must be had to soothing the nasal membrane by the application of warm milk and water, or decoction of poppies. The custom of blessing persons when they sneeze is very ancient and very widely spread.

SNIPE, the common snipe is a beautifully marked bird, about 10 or 11 inches long. It frequents marshy or moist grounds. It feeds on worms, insects, and small molluscs. It is remark-



Common snipe.

able for the length of its bill, its peculiar bleating cry, and the drumming-like noise it makes in summer. The jack snipe closely resembles the common snipe in its general habits and appearance. In North America, there are several species of snipe, Wilson's snipe,

being one of the chief. The name of sea snipe is sometimes given to the dunlin, while the name summer snipe is applied to the common sandpiper.

SNOW. Snow-flakes are assemblages of minute crystals of ice; they are formed when the temperature in a region of air containing a considerable quantity of aqueous vapor is lowered below the freezing-point. The particles of moisture contained in the atmosphere are then condensed and frozen, and form flakes, which descend to the earth. Each flake which falls is composed of a number of minute crystals of ice, which present countless modifications of the hexagonal system. They have great diversities of density, and display innumerable varieties of the most beautiful forms. These crystals usually adhere together to form an irregular cluster; and consequently the incident rays of light, which are refracted and reflected so as to present individually the prismatic colors, are scattered after reflection in all directions, and combine to give to the eye the color sensation of white. When sufficient pressure is



Crystals of snow, after Scoresby.

applied the slightly 'adhering crystals are brought into true molecular contact, when the snow, losing its white color, assumes the form of ice. Snow answers many valuable purposes in the economy of nature. Accumulated upon high regions it serves to feed, by its gradual melting streams of running water, which a sudden increase of water, in the form of rain, would convert into destructive torrents or standing pools; and in many countries it tempers the burning heats of summer by previously cooling the breezes which pass over them. In severer climates it serves as a defense against the rigors of winter by protecting vegetation from the frost, and by affording a shelter to animals which bury themselves under it. Even in more temperate climates it is found that vegetation suffers more from an open winter than when the fields, during that season, lie hidden beneath a snowy covering. Snow purifies the air and leaves it remarkably clear and pure. It has a greater purifying effect than rain and it is thought that the action of the snow on the oxygen in the air

may form ozone; at any rate it intensifies the vital qualities of the air, and this is why snow swept air is so exhilarating and exercise in the snow is so bracing.

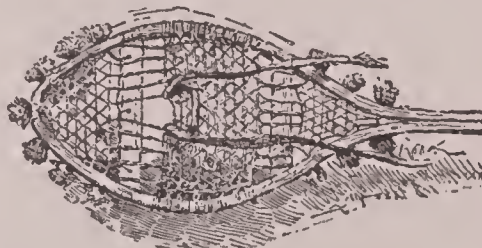
SNOWDROP, a well-known garden plant. It bears solitary drooping, and elegant white flowers.

SNOWDROP TREE, a name of ornamental trees of the southern states with flowers like snowdrops, belonging to the stynrax family.

SNOW-LINE, the limit of perpetual snow, or the line above which mountains are covered with perpetual snow. Since the temperature of the atmosphere continually diminishes as we ascend from the lower into the higher strata, there must be in every latitude a certain limit of elevation at which the temperature of the air is reduced to the freezing-point. This limit is called the snow-line, or line of perpetual congelation, and the mountains which rise above it are always covered with snow. The snow-line varies according to latitude, being highest near the equator and lowest near the poles. Local circumstances, however, affect it, as the configuration of the country, the quantity of snow falling annually, the nature of the prevalent winds, etc. From these circumstances the snow-line is at different heights in the same latitude.

SNOW-PLOW, an implement for clearing away the snow from roads, railways, etc. There are two kinds: one adapted to be hauled by horses on a common highway; the other to be placed in front of a locomotive to clear the rails of snow. A variety of the latter is adapted to street railways.

SNOW-SHOE, a kind of flat shoe, either made of wood alone, or consisting of a light frame crossed and recessed by thongs, the broad surface of which pre-



Snow-shoe.

vents the wearer from sinking in the snow. Snow-shoes are usually from 3 to 4 feet in length, and from 1 to 1½ foot broad across the middle.

SNUFF, a powdered preparation of tobacco inhaled through the nose. It is made by grinding, in mortars or mills, the chopped leaves and stalks of tobacco in which fermentation has been induced by moisture and warmth. The tobacco is well dried previous to grinding, and this is carried sometimes so far as to give to the snuff the peculiar flavor of the high-dried snuffs, such as the Irish, Welsh, and Scotch. Some varieties, as the rappees, are moist. The admixture of different flavoring agents and delicate scents has given rise to fanciful names for snuffs, which, the flavor excepted, are identical. Dry snuffs are often adulterated with quicklime, and the moist kinds with am-

monia, hellebore, pearl-ash, etc. See Tobacco.

SOAP, a chemical compound of common domestic use for washing and cleansing, and also used in medicine, etc. It is a compound resulting from the combination of certain constituents derived from fats, oils, grease of various kinds both animal and vegetable, with certain salifiable bases, which in household soaps are potash and soda. Chemically speaking soap may be defined as a salt, more especially one of the alkaline salts of those acids which are present in the common fats and oils, and soluble soaps may be regarded as oleates, stearates, and margarates of sodium and potassium. There are many different kinds of soaps, but those commonly employed may be divided into three classes: 1. Fine white soaps, scented soaps, etc.; 2. Coarse household soaps; 3. Soft soaps. White soaps are generally combinations of olive-oil and carbonate of soda. Perfumes are occasionally added, or various coloring matters stirred in while the soap is semifluid. Common household soaps are made chiefly of soda and tallow. Yellow soap is composed of tallow, resin, and soda, to which some palm-oil is occasionally added. Mottled soap is made by simply adding mineral and other colors during the manufacture of ordinary hard soap. Marine soap, which has the property of dissolving as well in salt-water as in fresh, is made of cocoa-nut oil, soda, and water. Soft soaps are generally made with potash instead of soda, and whale, seal, or olive-oil, or the oils of linseed, hemp-seed, rape-seed, etc., with the addition of a little tallow. Excellent soaps are made from palm-oil and soda. Soap is soluble in pure water and in alcohol; the latter solution jellies when concentrated, and is known in medicine under the name of opodeldoc, and when evaporated to dryness it forms what is called transparent soap. Medicinal soap when pure, is prepared from caustic soda, and either olive or almond oil. It is chiefly employed to form pills of a gently aperient antacid action.

SOBIESKI, John. See John III. (Sobieski).

SOCIALISM, the name applied to various theories of social organization, having for their common aim the abolition of that individual action on which modern societies depend, and the substitution of a regulated system of co-operative action. The word socialism, which originated among the English communists, and was assumed by them to designate their own doctrine, is now employed in a larger sense, not necessarily implying communism or the entire abolition of private property, but applied to any system which requires that the land and the instruments of production shall be the property, not of individuals, but of communities, or associations, or of the government, with the view to an equitable distribution of the products. It is looked on by those who believe in it as an evolutionary phase of society, as indeed a natural development—slavery gave way to feudalism, feudalism to capitalism, and the latter is bound to fall before the latest

stage, socialism. The earliest and most concrete forms of socialist philosophy are those promulgated by Robert Owen, St. Simon, and Fourier. Later theorists on the social question have taken wider, and even wilder views, their theories often ramifying into the more or less vague and disruptive schemes of the anarchists and nihilists. The literature on the subject is very extensive, and has had an important influence on modern thought, and, indeed, upon constructive legislation. Among the leading works to be consulted are Karl Marx's *Capital*; Fourier's *Œuvres Complètes*; Comte's *Traité de Sociologie*; Louis Blanc's *L'Organisation du Travail*; Hyndman's *Historical Basis of Socialism in England*; Bax's *Religion of Socialism*; etc.

SOCIAL SCIENCE, the science that deals with the social conditions, the relations, and institutions which are involved in man's existence and his well-being as a member of an organized community. It concerns itself more especially with questions relating to public health, education, labor, punishment of crime, reformation of criminals, pauperism, and the like. It thus deals with the effect of existing social forces, and their result on the general well-being of the community, without directly discussing or expounding the theories or examining the problems of sociology, of which it may be considered as a branch. (See *Sociology*.)

SOCIETY ISLANDS, an important group of islands of the South Pacific, between lat. $16^{\circ} 11'$ and $17^{\circ} 53'$ s., and lon. 148° and 155° w.; and between the Low islands on the east and the Friendly islands on the west. The group consists of the principal island of Tahiti or Otaheite—which is about 32 miles long, and is divided into two peninsulas by an isthmus about 3 miles broad; area, 412 sq. miles—and a number of comparatively small islands, Eimeo, Raiatea, Huahine, etc., all now belonging to France. All the islands are elevated, and more or less mountainous. Pop. estimated at about 12,000.

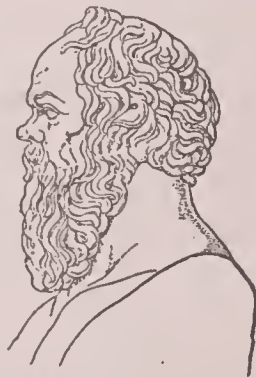
SOCI'NUS, the Latinized name of two celebrated theologians, uncle and nephew, who have given their name to a religious sect, the Socinians, whose modified doctrines are now known as Unitarianism.—Laelius Socinus (Lelio Sozzini), born in 1525 at Siena, in Tuscany, abandoned jurisprudence for the study of the Scriptures. In 1546 he was admitted a member of a secret society at Vicenza, formed for the discussion of religious questions, which arrived at the conclusion that the doctrine of the Trinity was untenable, and that many of the dogmas of the Roman Catholic church were repugnant to reason. The nature of their deliberations having become known the society was broken up, several of its members put to death, and others, among who was Socinus, fled the country. He died at Zürich in 1562.—Faustus Socinus (Fausto Sozzini), a nephew of the preceding, born at Siena in 1539, was obliged to leave that town in his twentieth year on account of his heretical notions. On the death of his uncle he came into possession of the manuscripts of the latter, by the study of which he

found his former opinions confirmed. His death took place in 1604. See *Unitarians*.

SOCIOLOGY, the science which investigates the laws of forces which regulate human society in all its grades, existing and historical, savage and civilized; or the science which treats of the general structure of society, the laws of its development, and the progress of actual civilization. Comte was the first to treat the subject from a scientific point of view. He was followed by Quetelet, Spencer, Ward and others. (See *Social Science*.)

SOCK, a low shoe or slipper, worn by the Greeks, and also by the Roman women, who had them highly ornamented. They were likewise worn by comic actors, the buskin, or cothurnus, being used in tragedy; hence sock and buskin are used figuratively as equivalent to comedy and tragedy.

SOC'RATES (-tēz), an ancient Greek philosopher, born at Athens in or about 469 B.C. He served as a common soldier in the campaign of Potidæa (432-429 B.C.), fought at the battle of Delium



Socrates, from ancient bust.

(424), and in 422 he marched with Cleon against Amphipolis. After the naval battle of Arginusæ (406) against the Spartans, ten Athenian officers were arraigned for neglecting the sacred duty of burying the slain. The clamor for their condemnation rose so high that the court wished to proceed in violation of all legal forms; but Socrates, the presiding judge at the trial, refused to put the question. Soon after he was summoned by the tyrannical government of the Thirty to proceed with four other persons to Salamis to bring back an Athenian citizen who had retired thither to escape the rapacity of the new government. Socrates alone refused. After this he declined to take any further share in public affairs, giving as a reason the warnings of an internal voice of which he was wont to speak. Following the promptings of this divine mentor he trained himself to coarse fare, scanty clothing, and indifference to heat or cold, and brought into thorough subjection his naturally impetuous passions. But though a sage he was wholly removed from the gloom and constraint of asceticism; he indeed exemplified the finest Athenian social culture, was a witty as well as a serious disputant, and did not refrain from festive enjoyment. Socrates wrote nothing, and neither sought to found a school nor a system of philosophy. His plan was to mix with

men freely in any place of public resort, when he questioned and suggested the right path to real knowledge. Aristophanes attacked him violently in his *Comedy of the Clouds* as a sophist, an enemy of religion, and a corrupter of youth. But he had many distinguished friends, such as Plato, Xenophon, Euclid of Megara, Antisthenes, Aristippus, Æschines, and Alcibiades. In 399 B.C. a formal accusation was brought against him charging him with not believing in the gods which the state worshiped, with introducing new divinities and with corrupting youth. His bold defense is preserved by Plato, under the title of the *Apology of Socrates*. He dwelt on his mission to convict men of their ignorance for their ultimate benefit; declared himself a public blessing to the Athenians; assuring them if his life were spared he would continue in the same course; and regarded the approach of death with utter indifference. He was condemned to death by a majority of his judges; refused help to escape, and thirty days after his sentence drank the hemlock cup with composure, and died in his 70th year (B.C. 399). The account of his last hours is given in full detail in the *Phædo* of Plato.

SODA, a term applied, in common language, to two or more substances—protoxide of sodium, hydroxide of sodium, and carbonate of sodium, being known under the name of soda. In scientific language, however, the name is only given to the protoxide of sodium the hydroxide being frequently called caustic soda. The protoxide of sodium is formed when sodium is burned in dry air or oxygen. It is a white powder, which attracts moisture and carbonic acid from the air. When this protoxide is dissolved in water there is formed the true alkali or hydrate of sodium, called also caustic alkali, which is a white brittle mass of a fibrous texture, having a specific gravity of 2.13. Caustic soda has a most corrosive taste and action upon animal substances; it dissolves readily both in water and alcohol; in the solid form it readily attracts water and carbonic acid from the atmosphere, the final product being an efflorescent carbonate. It forms soaps when boiled with tallow, oils, wax, rosin; dissolves wool, hair, silk, horn, alumina, silica, sulphur, and some metallic sulphides. With acids soda forms salts which are soluble in water, and many of which crystallize. The carbonate of soda is the soda of commerce in various states, either crystallized in lumps or in a crude powder called soda-ash. It is obtained from the ash of plants growing near the sea, from native sources, or by chemical processes. The soda obtained from plants contains from 3 to 30 per cent of carbonate. It is imported from Spain under the name of barilla, from France as silicar or blanquette, and from Normandy and Brittany as varec. Native soda comes to us chiefly from the mineral waters of Karlsbad, Aix, Vichy, and the geysers of Iceland; from the Caspian and Black sea, from California and Virginia. But the amount of soda derived from these sources is as nothing compared with that manufactured every year by chemical processes. In these

the first process is the decomposition of common salt (chloride of sodium) by means of sulphuric acid; the second, the conversion of the sulphate of sodium so produced into crude carbonate of soda by strongly heating with chalk and carbonaceous matter; third, the purification of this crude carbonate, either into a dry white soda-ash or into crystals; and, fourth, the treatment of the by-products—hydrochloric acid and calcium sulphide. The chief uses of soda are in the manufacture of glass and of hard soap. The carbonate of soda is used in washing, and is a powerful detergent. It is also used in medicine. Sulphate of soda is glauber-salts.

SODA-WATER, an effervescing drink generally consisting of ordinary water into which carbonic acid has been forced under pressure. It rarely contains soda in any form. It is useful in cases of debility of the stomach, accompanied with acidity.

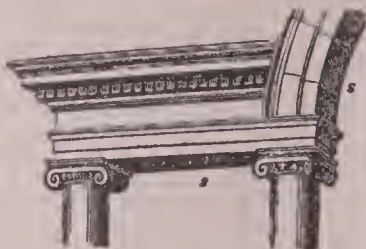
SODIUM, the metal of which soda is the oxide. It was discovered by Sir Humphry Davy in the year 1807. Previously the oxide of the metal, soda, was looked on as an elementary body, but Davy succeeded in breaking it up, by the action of electricity, into oxygen and a new metal. Gay-Lussac and Thénard soon afterward procured it in greater quantity by decomposing soda by means of iron; and Brunner showed that it may be prepared with much greater facility by distilling a mixture of carbonate of soda with charcoal; it is now prepared by the latter process in considerable quantities. Sodium is a silver-white metal, having a very high luster. It melts at 204° Fahr., and oxidizes rapidly in the air, though not so rapidly as potassium. It decomposes water instantly, but does not spontaneously take fire when thrown on water, unless the water be somewhat warm, or the progress of the globe of sodium upon the surface of the water be impeded. When heated in air or oxygen it takes fire and burns with a very pure and intense yellow flame. It is perhaps more abundant in our globe than any other metal, for it constitutes two-fifths of all the sea-salt existing in seawater, in the water of springs, rivers, and lakes, in almost all soils and in the form of rock-salt. It is used as an agent in the manufacture of aluminium and magnesium, and as a reagent in chemical operations. Common salt is a compound of chlorine with sodium. Sodium also occurs as oxide of sodium or soda in a good many minerals; and more especially in the form of carbonate, nitrate, and borate of soda. Sodium is contained in sea plants, and in land plants growing near the sea. It occurs also in most animal fluids. The only important oxide of sodium is the protoxide known as soda. See Soda.

SODOM, the principal of the five cities (Sodom, Gomorrah, Admah, Zeboim, and Zoar) described in the book of Genesis and the cities of the plain (i.e. of Jordan). They were overthrown on account of the wickedness of the inhabitants (Gen. xix.), with the exception of Zoar, which was spared at the supplication of Lot.

SODOM, Apple of, a fruit mentioned

by early writers as growing on the shores of the Dead sea, which was beautiful to the eye, but when eaten filled the mouth with ashes; supposed to have been a gall produced on dwarf oaks by an insect, or the fruit of a species of *Solanum*.

SOFFIT, in architecture, any ceiling divided into square compartments, or



s s, Soffits.

panels; also the lower surface of an architrave, an arch, a balcony, a cornice, etc.

SO'FIA, So'phia, the capital of the principality of Bulgaria, situated in a plain on the river Bogana, near the foot of the north side of the Balkan mountains, 310 miles w.n.w. of Constantinople. Pop. 67,920.

SOIL, mould, or that compound earthy substance which furnishes nutriment to plants, or which is particularly adapted to support and nourish them. Wherever the surface of the earth is not covered with water, or is not naked rock, there is a layer of earth more or less mixed with the remains of animal and vegetable substances in a state of decomposition, which is commonly called the soil. In uncultivated grounds soils generally occupy only a few inches in depth on the surface; in cultivated grounds their depth is generally the same as that to which the implements used in cultivation have penetrated. The stratum which lies immediately under the soil is called the subsoil, which is comparatively without organized matter. Soil is composed of certain mixtures or combinations of the following substances: the earths, silica, alumina, lime, magnesia; the alkalies, potassa, soda, and ammonia; oxide of iron and small portions of other metallic oxides; a considerable proportion of moisture, and several gases, as oxygen, hydrogen carbonic acid. Besides these every soil contains vegetable and animal matters, either partially or wholly decomposed.

SOLANA'CEÆ, a natural order of monopetalous exogenous plants, composed of herbs or shrubs, natives of most parts of the world, and especially within the tropics. They have alternate leaves, terminal or axillary inflorescence, and regular, or nearly regular monopetalous flowers.

SOLAR CORONA. See Corona.

SOLAR DAY. See Day.

SOLAR ENGINE, an apparatus for utilizing the heat of the sun as a motive power, by causing it, through the medium of a reflecting metallic mirror, to heat the water in a small boiler and convert it into steam.

SOLAR MICROSCOPE, an instrument by means of which a magnified image of a small transparent object is projected on a screen, the light em-

ployed being sunlight. It is really a magic lantern, in which the microscopic object is affixed to a clear glass plate, and the light employed bright sunlight reflected into the instrument.

SOLAR PROMINENCES, red flame-like masses seen in the atmosphere of the sun at a total solar eclipse. See Sun.

SOLAR SYSTEM, in astronomy, that system of which the sun is the center. To this system belong the planets, planetoids, satellites, comets, and meteorites, which all directly or indirectly revolve round the sun, the whole being bound together by the mutual attractions of the several parts. See Astronomy, Planets, Sun, Moon, Gravitation, etc.

SOLAR TIME, time as indicated by a sun-dial. The successive hours so indicated are not equal intervals of time. See Day, Equation of Time.

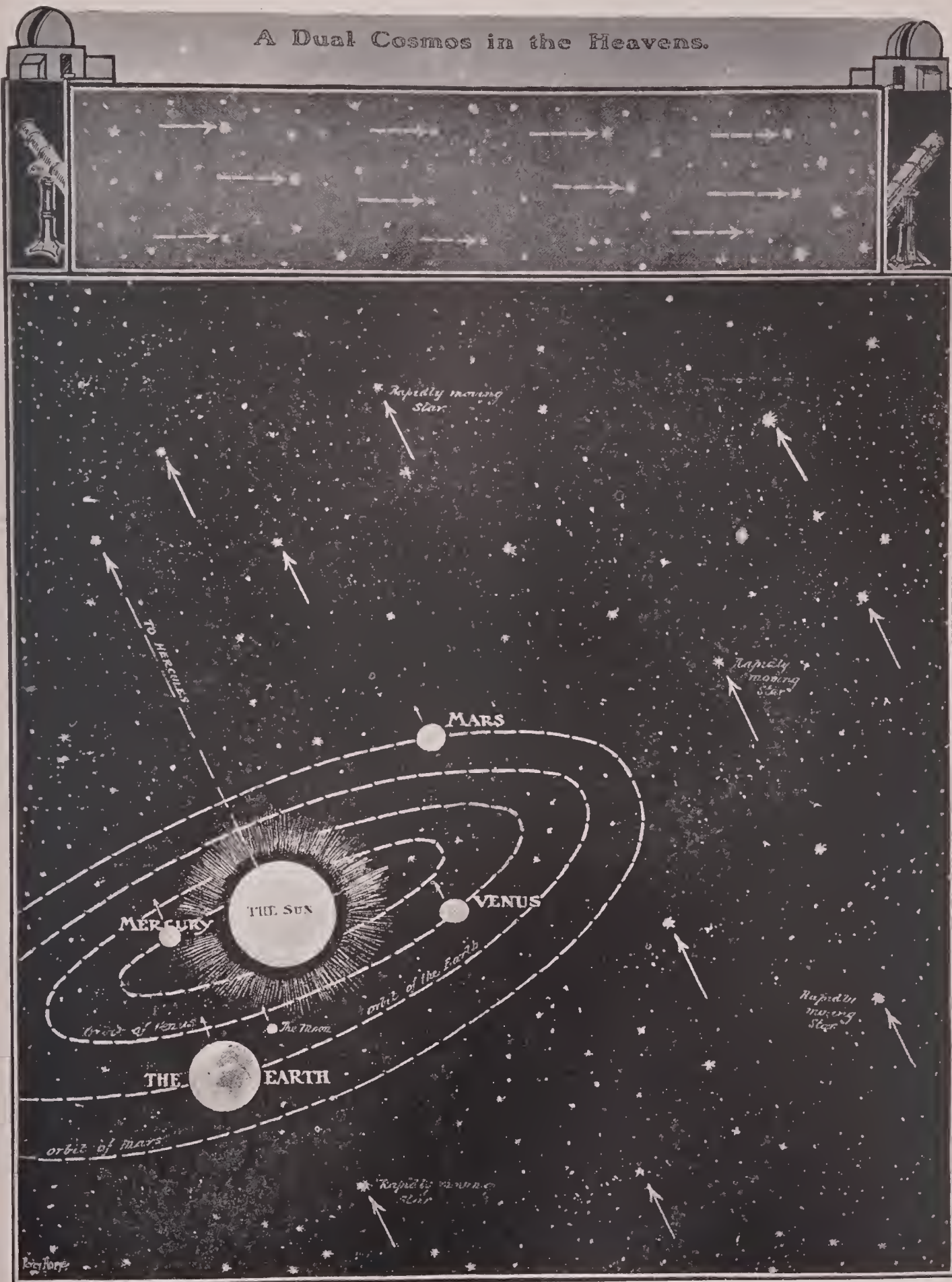
SOLDERS, metallic cements consisting of simple or mixed metals, by which ordinarily metallic bodies are firmly united with each other. It is a general rule that the solder should always be easier of fusion than the metal intended to be soldered by it. The usual solders are compound, and are divided into hard and soft. The hard solders are ductile, will bear hammering, and are commonly prepared of the same metal with that which is to be soldered, with the addition of some other, by which a greater degree of fusibility is obtained. Under this head comes the hard solder for gold, which is prepared from gold and silver, or gold and copper, or gold, silver and copper. The hard solder for silver is prepared from equal parts of silver and brass, but made easier of fusion by the admixture of one-sixteenth of zinc. The hard solder for brass is obtained from brass mixed with a sixth, or an eighth, or even one-half of zinc, which may also be used for the hard solder of copper. The soft solders melt easily, but are partly brittle, and therefore cannot be hammered. Of this kind are the following mixtures: tin and lead in equal parts; bismuth, tin, and lead in equal parts; one or two parts of bismuth, of tin and lead each one part. In soldering, the surfaces to be united must be made perfectly clean and free from oxide. This is commonly effected by scraping the surfaces; and in order that the formation of any oxide may be prevented during the process, borax, sal ammoniac, or rosin is used, either mixed with the solder or applied to the surfaces.—Autogenous soldering is the union of two pieces of metal without the intervention of any solder, by fusing them at the point of junction by jets of flame from a gas blowing-pipe or by other means.

SOLDIER. See Army, Conscription, Enlistment, Militia, etc.

SOLDIER-BEETLE, a name given to carnivorous colcolopterous insects of the genus *Telephorus*, from their reddish color, or from their combativeness.

SOLE, a marine fish belonging to the flat-fishes, of an oblong or oval form. These fish abound on the British coast, and also on all the coasts of Europe, except the most northern, where the bottom is sandy. They furnish a wholesome and delicious article of food. They

A Dual Cosmos in the Heavens.

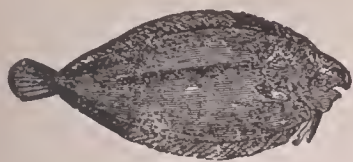


HOW OUR SOLAR SYSTEM IS TRAVELING TOWARDS THE CONSTELLATION, HERCULES, AMONG THE FAST MOVING STARS

A new conception of the Universe, which is of a highly interesting character is now being discussed. From recent researches it appears that there are two great "star drifts" among the so-called "fixed stars." One body of stars moves three or four times as fast as the other and everything interpenetrates it. Our sun appears to be one of the fast moving stars and is drifting away towards the constellation, Hercules, in the company of the rapidly moving half of the cosmos. The sun also has a motion of its own among these stars. For the purpose of clearness only the inner planets are shown on the above diagram

SOLEURE

sometimes ascend rivers, and seem to thrive quite well in fresh water. The



Sole.

sole sometimes grows to the weight of 6 or 7 lbs.

SOLEURE (so-leur), a canton of Switzerland, bounded on the north by Basel-Land; west, south, and southeast by Bern; and east by Aargau; area, 306 sq. miles. Pop. 100,838.—Soleure, the capital, is situated on the south side of the Jura chain, on both sides of the Aar. Pop. 10,116.

SOL-FA SYSTEM. See Tonic Sol-fa System.

SOLIDIFICATION, the passage of a body into the solid state. A body, on solidifying from the liquid state, gives up a quantity of heat without exhibiting a decrease of temperature. Two laws are recognized in the solidifying of bodies from a state of fusion:—(1) A substance begins to solidify at a temperature which is fixed if the pressure is fixed; at ordinary atmospheric pressure this temperature is the temperature or point of fusion for the particular substance. (2). From the moment solidification commences till it is completed the temperature of the liquid portion is constant. There are some substances, such as glass and iron, which become plastic before liquefying, and therefore possess no definite point of fusion; and for such substances the above laws do not hold. Solidification is called crystallization when crystals which may be seen are formed. When water solidifies the resulting ice is about $\frac{1}{11}$ larger than the volume of water which produced it, and on this account ice floats on the surface. Cast-iron is larger, at the temperature of the fusing-point, in the solid than in the liquid state; so also is bronze and other metals which give good sharp castings. In many cases however, a substance contracts in the act of solidifying.

SOLIMAN' II. See Solyman II.

SOLMIZATION, in music, an exercise for acquiring the true intonation of the notes of the scale, first by singing them in regular gradation upward and downward, and then by skips over shorter or longer intervals. To facilitate this various expedients have been devised, the most popular being the association of the several sounds with certain syllables, such as ut, re, mi, fa, sol, la, said to have been first used by Guido of Arezzo in the 11th century—an additional syllable, si, for the seventh of the scale, being introduced at a much later date. In the tonic sol-fa method these syllables are thus modified—doh ray, me, fah, soh, lah, te. See Tonic Sol-fa.

SOLO, a tune, air, or strain to be played by a single instrument or sung by a single voice without or with an accompaniment, which should always be strictly subordinate.

SOLOMON, son of David, king of

Israel, by Bathsheba, formerly the wife of Uriah, was appointed by David to be his successor in preference to his elder brothers. By his remarkable judicial decisions, and his completion of the political institutions of David, Solomon gained the respect and admiration of his people; while by the building of the temple, which gave to the Hebrew worship a magnificence it had not hitherto possessed, he bound the nation still more strongly to his throne. The wealth of Solomon, accumulated by a prudent use of the treasures inherited from his father; by successful commerce; by a careful administration of the royal revenues; and by an increase of taxes—enabled him to meet the expense of erecting the temple, building palaces, cities, and fortifications, and supporting the extravagance of a luxurious court. Fortune long seemed to favor this great king; and Israel, in the fulness of its prosperity, scarcely perceived that he was continually becoming more despotic. Contrary to the laws of Moses, he admitted foreign women into his harem; and from love of them he was weak enough in his old age to permit the free practice of their idolatrous worship and even to take part in it himself. The forty years' reign of Solomon is still celebrated among the Jews, for its splendor and its happy tranquility, as one of the brightest periods of their history. The writings attributed to Solomon are the Book of Proverbs, Ecclesiastes, and the Song of Solomon, with the apocryphal book the Wisdom of Solomon; but modern criticism has decided that only a portion of the Book of Proverbs can be referred to Solomon.

SOLOMON ISLANDS, (1) a chain of islands in the Western Pacific, east of New Guinea, and between New Britain and New Hebrides. (2) A group of small islands with no permanent inhabitants, in the Indian ocean, dependencies of Mauritius.

SOLOMON'S SEAL, the common name of plants, a genus of liliaceous but not bulbous plants, with axillary cylindri-



Solomon's seal.

cal six-cleft flowers, the stamens inserted in the top of the tube, and the fruit a globose three-celled berry.

SOLOMON'S SONG (called also the Song of Songs, or Canticles), one of the canonical books of the Old Testament. From the earliest period this book has been the subject of voluminous controversies. It seems to have been a recognized part of the Jewish canon in the time of Jesus. Till the beginning of the

SOLSTICE

19th century the author of the book was almost universally believed to be Solomon. Modern critics, however, attribute it to an author of northern Israel, who wrote it about the middle of the 10th century B.C., shortly after the death of Solomon, in a spirit of protest against the corrupt splendor of the court of Zion. The unity of the poem is sufficiently evidenced by the continuity of names, characters, and subject, and is taken for granted by the majority of critics. The main subject of dispute has been as to its interpretation. The various theories in regard thereto are too numerous to specify; but they naturally fall into two classes, the literal and allegorical. The highest form of allegorical significance contended for is the mystical or spiritual interpretation, by which the whole poem becomes a figurative representation of the hopes and aspirations, together with the trials and difficulties, of a spiritual life. This interpretation, whether applied individually or collectively to the church or nation of Israel, was almost universally received both by Jews and Christians until recent times. The most favored literal interpretation is that originally given by Jacobi, that the poem represents the temptation and triumph of virtuous love. The supporters of the allegorical interpretation of the book strongly urge the frequency with which the marriage relation is employed, both in the Old and New Testament, to represent the relation of Jehovah to Israel in the old, and of Christ to the church in the new dispensation.

OLON, one of the seven wise men of Greece, and great legislator of Athens, born about B.C. 640. He was of good family, and acquired a wide knowledge of the world in commerce and travel. One of his earliest public transactions was in stirring the Athenians up to the recovery of Salamis, after which he was chosen chief archon (B.C. 594) and invested with unlimited powers, the state of parties in Athens being such as to threaten a revolution. He established a new constitution, divided the citizens according to their wealth, and added to the powers of the popular assembly. He made many laws relating to trade, commerce, etc. He either entirely abrogated all debts, or so reduced them that they were not burdensome to the debtors; and abolished the law which gave a creditor power to reduce his debtor to slavery. When he had completed his laws he bound the Athenians by oath not to make any changes in his code for ten years. He then left the country, to avoid being obliged to make any alterations in them, and visited Egypt, Cyprus and other places. Returning after an absence of ten years, he found the state torn by the old party hate; but all parties agreed to submit their demands to his decision. It soon became evident, however, that Pisistratus would succeed in seizing the sovereignty, and Solon left Athens. Though Athens now fell under the despotic rule of Pisistratus, much of Solon's legislation remained effective. He is supposed to have died in his eightieth year, about B.C. 558.

SOLSTICE, in astronomy, the point in the ecliptic at the greatest distance from

the equator, at which the sun appears to stop or cease to recede from the equator, either north in summer or south in winter. There are two solstices—the summer solstice, the first degree of Cancer, where the sun is about the 21st of June; and the winter solstice, the first degree of Capricorn, where the sun is about the 22d of December. The time at which the sun is at either of these points also receives the same name.

SOLUTION, the transformation of matter from either the solid or the gaseous state to the liquid state by means of a liquid called the solvent, or sometimes the menstruum. When a liquid adheres to a solid with sufficient force to overcome its cohesion, the solid is said to undergo solution, or to become dissolved. Thus sugar or salt are brought to a state of solution by water, camphor or resin by spirit of wine, silver or lead by mercury, and so on. Solution is facilitated by increasing the extent of surface in a solid, or by reducing it to powder. Heat also, by diminishing cohesion, favors solution; but there are exceptions to this rule, as in the case of lime and its salts, water just above the freezing-point dissolving nearly twice as much lime as it does at the boiling-point. If a solid body be introduced in successive small portions into a definite quantity, of a liquid capable of dissolving it, the first portions disappear most rapidly, and each succeeding portion dissolves less rapidly than its predecessor, until solution altogether ceases. In such cases the forces of adhesion and cohesion balance each other, and the liquid is said to have saturated. Various solids dissolve in the same liquid at very different rates; thus baric sulphate may be said to be insoluble in water; calcic sulphate requires 700 parts of water for solution; potassic sulphate, 16; magnesian sulphate 1.5. When water is saturated with one salt it will dissolve other salts without increase of bulk. It sometimes happens that the addition of a second solid will displace the first already in solution.

SOLYMAN', or **SULEIMAN II.**, surnamed the Magnificent, Sultan of Turkey, was the only son of Selim I., whom he succeeded in 1520. Having put down a revolt which occurred in Syria and Egypt, and concluded an armistice with Persia, he besieged and took Belgrade in 1521. The next year he captured the island of Rhodes, which had been in the possession of the knights of St. John for 212 years. Turning his arms now against Hungary, he gained the battle of Mohács and captured Buda and Pest. In 1529 he advanced on Vienna, but was forced to raise the siege with great loss. His armies next gained considerable territories from Persia. In 1541 he overran a great part of Hungary, but an armistice was concluded for five years in 1547 though war was renewed in 1551. In 1565 he attempted the capture of Malta in vain. Next year he died at the siege of Szigeth, in Hungary, in the seventy-sixth year of his age. See Ottoman Empire.

SOMAULI, or **SOMALI LAND**, a country of Eastern Africa, forming the "eastern horn" of the continent, bounded on the north by the Gulf of Aden, and on the east by the Indian ocean from Cape

Guardafui to the equator and the river Jub. The Somáli are a fine race, mainly Mohammedans though still in a barbarous state. The principal articles of trade or produce are myrrh, ivory, ostrich-feathers, hides and horns, coffee, indigo, and gum-arabic. The ports of Berbera and Zeilah with an adjacent strip on the northern coast now belong to Britain; a part is claimed by Italy.

SOMERSET, a county of England, bounded by Gloucestershire, Wiltshire, Dorsetshire, and Devonshire; area, 1,049,812 acres, nearly nine-tenths of which are now under cultivation. The chief minerals worked are lead, iron, and slate. The principal rivers are the Avon and Parret. Wheat and cattle of excellent quality are raised. The manufactures are mostly woolen and worsted goods, gloves, silk, linen, crape, and lace. Pop. 508,104.

SOMERS ISLANDS. See Bermudas Islands.

SOMERVILLE, a city in Massachusetts, 3 miles from Boston, of which it may be regarded as a suburb. Pop. 1909. estimated at 75,000.

SOMME, a department of France, bounded on the northwest by the English channel, with an area of 2379 sq. miles. The capital is Amiens. Pop. 548,982.

SOMME, a river of France, which rises in the department of Aisne, 7 miles northeast of St. Quentin; flows southwest into the department of the Somme, and falls into the English channel about 15 miles beyond Abbeville; length, 150 miles.

SOMNAM'BULISM, a peculiar perversion of the mental functions during sleep, in which the subject acts automatically. The organs of sense remain torpid and the intellectual powers are blunted. During this condition some instinctive excitation may take place and there may be the reproduction of impulses, in consequence, of different kinds. Walking in sleep is the most palpable, but not the most marvellous characteristic of this condition. The person affected may perform many voluntary actions implying to all appearance a certain degree of perception of the presence of external objects. The somnambulist gets out of bed, often dresses himself, goes out of doors, and walks frequently over very dangerous places in safety. On awakening in the morning he is either utterly unconscious of having stirred during the night, or remembers it as a mere dream. Sometimes the transactions of the somnambulist are carried much further; he will mount his horse and ride, or go to his usual occupation. In some cases somnambulists are capable of holding conversation. Somnambulism occurs in the sensitive and excitable, often in conjunction with other nervous affections, and is hereditary. Artificial somnambulism is induced by hypnotism, and the consciousness is for the time entirely absorbed by one set of ideas.

SONA'TA, in music, a term originally applied to any kind of composition for instruments, in contradistinction to vocal compositions, which were called cantatas. The name was subsequently, however, restricted to compositions for

solo instruments (generally the piano-forte). Sonatas are of a certain form, consisting of several movements—at first three, the allegro, adagio, and rondo, to which afterward a fourth was added, the minuetto or scherzo—which differ from each other in time and sentiment, but are held together by their general character.

SON'DRIO, a town in North Italy, capital of the province of the same name. Pop. 6990.—The province lies between the Grisons and the Tyrol, with an area of 1257 sq. miles. Pop. 120,516.

SONG, a little poem intended to be sung; a lyric. The term is applied to either a short poetical or musical composition, but most frequently to both in union. As a poetical composition a song may be defined as a short poem divided into portions of returning measure, and turning upon some single thought or feeling. As a union of poetry and music, it may be defined as a brief lyrical poem, founded commonly upon agreeable subjects, to which is added a melody for the purpose of singing it. As denoting a musical composition, it is generally confined to an air for a single voice—airs for more than one voice being, however, sometimes called part-songs.

SONNET, a species of poetical composition consisting of fourteen rhymed verses, ranged according to rule. It is of Italian origin, and consists of two stanzas of four verses each, called the octave, and two of three each, called the sestet. The octave of the proper sonnet consists of two quatrains, the rhymes of which are restricted to two—one for the first, fourth, fifth, and eighth lines; the other for the second, third, sixth, and seventh. In the sestet, which is commonly made up of two tercets, the rhymes may be two or three, variously distributed. This is the Petrarchan or Italian form, but the verses may also be arranged in the Shakespearean form of three quatrains of alternate rhymes clinched by a couplet, or in the irregular form practiced by Coleridge and others. The sonnet generally consists of one principal idea, pursued through the various antitheses of the different strophes. The lightness and richness of the Italian, Spanish, and Portuguese languages enable their poets to express every feeling or fancy in the sonnet; but in English it has been found most suitable to grave, dignified, and contemplative subjects. Among the most successful writers of English sonnets are Shakespeare, Milton, Drummond, of Hawthornden, Bowles, Wordsworth, and Rossetti.

SONO'RA, one of the states of Mexico, lying on the Gulf of California, on which it has several good ports. Guaymas is the principal port, and has a splendid harbor. The capital is Hermosillo. Pop. 220,553; area, 79,021 sq. miles.

SOO-CHOW-FOO, a town of China, in the province of Kiangsoo, on a lake in the line of the Imperial canal, 125 miles southeast of Nankin. It was opened to foreign trade in 1895. Pop. above 500,000.

SOOT, a black substance formed by combustion, or disengaged from fuel in the process of combustion, rising in fine particles and adhering to the sides of the

chimney or pipe conveying the smoke. The soot of coal and that of wood differ very materially in their composition, the former containing more carbonaceous matter than the latter. Coal-soot contains substances usually derived from animal matter; also sulphate and hydrochlorate of ammonia; and has been used for the preparation of the carbonate. It contains likewise an empyreumatic oil; but its chief basis is charcoal, in a state in which it is capable of being rendered soluble by the action of oxygen and moisture; and hence, combined with the action of the ammoniacal salts, it is used as a manure, and acts very powerfully as such. The soot of wood has been minutely analyzed, and found to consist of fifteen different substances, of which ulmin, nitrogenous matter, carbonate of lime, water, acetate and sulphate of lime, acetate of potash, carbonaceous matter insoluble in alkalis, are the principal.

SOPHISTS, the name of a school or congeries of schools of philosophical teachers or "thinkers," who appeared in Greece in the period immediately preceding and contemporary with Socrates in the latter part of the 5th century B. C. It was a period of political decline and social corruption, and the sophists were men who, although often able and sometimes well meaning, were not strong enough to rise above the unwholesome influences under which they were placed. Their philosophy (if it can be called so) was one of criticism of those that had gone before; there was nothing creative in it, nothing even formative. The tendency of the teaching of the sophists was mainly skeptical as regards previous philosophical speculation; and while the chief point of convergence of their teaching was in an ethical direction, the influence of their ethical teaching was mostly mischievous. But the sophists rendered considerable service to science and literature, and even indirectly to philosophy.

SOPHOCLES (-klēz), the second in order of time of the three great Greek tragic dramatists, was born at Colonus, a village in the immediate vicinity of



Sophocles, from ancient bust.

Athens, in the second year of the seventy-first olympiad, B.C. 495. Sophocles first appeared as a dramatist in B.C. 468, when he took the first prize in competition with Æschylus. Æschylus retired to Sicily, and only returned to enter again for a brief period into the lists with Sophocles. Sophocles accord-

ingly held all but undisputed supremacy until the appearance of Euripides, who took the first prize in 441. In his old age he suffered from family dissension. His son, Iophon, jealous of the favor he showed to his grandson Sophocles, and fearing he himself would suffer from it in the disposition of his property, summoned him before the judges, and charged him with being incompetent to manage his affairs. In reply Sophocles read a part of the chorus of his *Œdipus at Colonus*, which he had just composed, and at once proved that his faculties were unimpaired. He died about the age of ninety. One hundred and thirty plays in all are ascribed to him, of which seventeen are supposed to be spurious. Eighty-one of his dramas, including the seven now extant, were brought out after he had attained the age of fifty-five. The chronological order of the existing plays is given as follows: *Antigone*, *Electra*, *Trachinæ*, *Œdipus Tyrannus*, *Ajax*, *Philoctetes*, *Œdipus at Colonus*. Sophocles brought the Greek drama to the highest point of perfection of which that form of art is susceptible. His subjects are human, while those of Æschylus are heroic, and in his management he shows himself a perfect master of human passions. The tendency of his plays is ethical, and he subordinates the display of passions to an end. He also introduced scenic illustration and a third actor. No tragic poet in ancient or modern days has written with so much elevation and purity of style. The versification of Sophocles stands alone in dignity and elegance, and his iambics are acknowledged to be the purest and most regular.

SOPRA'NO, the highest register of female voices. Its ordinary range is from C below the treble staff to A above it, though some sopranos may go as high as E. The mezzo-soprano register is from A to F, that is, a third lower than the soprano.

SORGHUM, a genus of grasses, some species of which are known by the general name of millet. They are tall



Sorghum.

grasses with succulent stems, and are found in the tropical parts of Asia, whence they have spread to other warm regions. It is the largest of the small cereal grains, and is called Guinea-corn and Indian millet. Sorghum has been introduced into the south of Europe, where it is chiefly used for feeding cattle and poultry, but it is also made into cakes. In the United States they are grown as forage plants in the western states where they have become important crops.

SO'RIA, a town of Northeastern Spain capital of the province of that name, on the Douro. Pop. 5869.—The province of Soria has an area of 3836 sq. miles, and a pop. of 160,684.

SORREL-TREE. It inhabits the range of the Alleghanies from Virginia to Georgia. The leaves are 4 or 5 inches long, oval-acuminate, finely toothed, and strongly acid in taste. The flowers are small, white, and disposed in long one-sided racemes, clustered in an open panicle.

SOUDAN', or **SUDAN'**, is the Arab name given to the vast extent of country in Central Africa which lies between the Sahara on the n., Abyssinia and the Red sea on the e., the countries draining to the Congo basin on the s., and Senegambia on the w. Its area is estimated at 2,000,000 sq. miles., and its pop. at from 7 or 8 to 30 millions. The inhabitants comprise numerous nations of different races, chiefly the Negro, together with Arab colonists and traders. The Western and Central Soudan are divided into a number of more or less independent states under British, French or German influence, as Gando, Sokoto, Bornu, Baghirmi, Wadai, etc. The Eastern Soudan includes Darfur, Kordofan, etc. Egyptian rule was first extended to the Eastern Soudan in the early part of the 19th century by Mohammed Ali, under whom Ibrahim Pasha carried it as far south as Kordofan and Senaar. An Egyptian expedition under Sir Samuel Baker in 1870 led to the conquest of the equatorial regions on the Nile farther south than the Soudan proper, of which General Gordon was appointed governor-general in 1874. On the fall of Ismail Pasha of Egypt Gordon was recalled, and hordes of Turks, Circassians, and Bashi-Bazouks were let loose to plunder the Soudanese. Egyptian misrule then became intolerable and in this crisis appeared Mohammed Ahmed of Dongola, who gave himself out to be the Mahdi, the long-expected redeemer of Islam. Emin Pasha (Eduard Schnitzer) was appointed governor of the Equatorial Province on the Upper Nile, north of the Albert Nyanza, by Gordon in 1878, and he continued to hold his ground here till 1889, when he was relieved by Henry M. Stanley, and conveyed with his followers to Zanzibar. The Eastern Soudan was wrested from the Mahdi's successor in 1898, and is now under Anglo-Egyptian rule.

SOUL, the rational and spiritual part in man which distinguishes him from the brutes, the indwelling spirit of man, which is both immaterial and immortal. Soul is sometimes used as synonymous with mind, but generally it is used in a wider sense as being a whole to which pertain the faculties that constitute mind. Soul and spirit are more nearly synonymous, but each is used in connections in which it would be improper to use the other. Nearly all philosophies agree in regarding the soul as that part of man which enables him to think and reason, and which renders him a subject of moral government; but they differ when it comes to a question of origin and detail. Many philosophers maintain the indestructibility as well as the immateriality of the soul; but a whole

host of others, both in ancient and modern times, have assigned a material basis to consciousness, and all that we regard as belonging to the soul. Modern materialists usually make the soul, or what others regard as such, merely a result of organism.

SOUL (sè-ül), capital of Corea, about 27 miles from the sea, not far from the right bank of the Han river, a tributary of the Yellow sea. Pop. 150,000, or with suburbs 300,000.

SOULT (sölt), Nicolas Jean de Dieu, Duke of Dalmatia and Marshal of France, was born at Saint Amans la Bastide, in the department of Tarn, in 1769. Raised from the ranks he became successively lieutenant and captain in his regiment. After successive promotions he was named general of division by Masséna, to whose army he was attached. In 1803 he had the command of one of the three camps of the army intended against England, that at St. Omer. He was one of the marshals created immediately after the formation of the empire in 1804. He acquired new fame in the Prussian campaign; and in 1807, after the battle of Friedland, took Königsberg. From 1808-12



Marshal Soult.

he fought in Spain, but, overmatched by Wellington, was unable to gain many laurels. In 1813 he was recalled in consequence of Napoleon's disasters, to take the command of the fourth corps of the grand army, and commanded the infantry of the guard at Lützen. On the news of Wellington's victory at Vittoria he was sent back to reorganize the French force in Spain, and did his utmost to oppose Wellington's triumphant career till Napoleon's abdication. Soult gave in his adhesion to Louis XVIII., who appointed him commander of the thirteenth military division; and in 1814 made him minister of war. On Napoleon's return he joined his standard, and held the post of major-general of the army in the campaign of Waterloo. After the second restoration he took up his residence at Düsseldorf, but was permitted to return to France in 1819; and in 1827 was raised to the peerage. After the July revolution of 1830, and on two subsequent occasions, he held ministerial office, and in 1846, on retiring from public life, was created grand-marshal of France. He died in 1851.

SOUND. See Acoustics and Ear.

SOUNDING, the operation of trying

the depth of water and the quality of the bottom, especially by means of a plummet sunk from a ship. In navigation two plummets are used, one called the hand lead, weighing about 8 or 9 lbs.; and the other, the deep-sea lead, weighing from 25 to 30 lbs. The former is used in shallow waters, and the latter at a distance from shore. The nature of the bottom is commonly ascertained by using a piece of tallow stuck upon the base of the deep-sea lead, and thus bringing up sand, shells, ooze, etc., which adhere to it. The scientific investigation of the ocean and its bottom has rendered more perfect sounding apparatus necessary, and has led to the invention of various contrivances for this purpose, among the most simple and common of which is Brooke's sounding apparatus. Some of the deepest sea-soundings yet obtained that can be relied on have been obtained by H. M. S. Challenger. See Ocean.

SOUP, a decoction of flesh in water, properly seasoned with salt, spices, etc., and flavored with vegetables and various other ingredients. There are very many kinds of soup, the introduction of a different ingredient furnishing the occasion for a distinctive name, but they may all be divided into two classes—clear soup and thick soup. Maigre soup is a soup made without meat.

SOURABAYA (sō-rā-bā'yā), a seaport of Java, capital of a province of the same name, on the Strait of Madura. Pop. 100,000.

SOURAKRATA, or SOLO, a town of Java, capital of the province of the same name, 140 miles w.s.w. of Sourabaya. Pop. 50,000.

SOUSA (sōzā), John Philip, American bandmaster and author, was born in Washington, D. C., in 1854. From 1880-1892 he was bandmaster of the United States Marine Corps at Washington and during this period made the organization one of the finest military bands in America. In 1892, he formed the organization known as Sousa's Band. His compositions have been eminently successful. His ability as a composer of marches soon secured for him the popular title of the "March King." His compositions include the following operas: The Smugglers, Désirée, El Capitan, The Bride Elect, The Charlatan. Marches: The Washington Post, Manhattan Beach, El Capitan, Bride Elect, The Stars and Stripes Forever. He has written several books which have had great success, among them being The Fifth String and Pipetown Sandy.

SOUTH, University of the, an institution of learning at Sewanee, Tenn., founded in 1857 by the Protestant Episcopal church of the south and opened in 1868 with a grammar school and an academic department. The theological department was opened in 1878, a medical department in 1892, law department in 1893. The academic department embraces 15 schools, a certificate and diploma being given in each school. The degrees conferred are B.A., M.A., M.S., and C.E. The work is mostly prescribed. In theology the degrees of B.D. and graduate in divinity are given; in law, LL.B.; in medicine, M.D. A school of pharmacy, with the

degree of graduate of pharmacy, and a training school for nurses are connected with the medical school

SOUTH AFRICAN REPUBLIC. See Transvaal.

SOUTH AMERICA is a vast peninsula of a roughly triangular form, with its apex pointing southward, extending in length from lat. 12° 30' n. to Cape Horn in lat. 55° 59' s. Its greatest length is 4800 miles; its greatest breadth 3230 miles; area, about 7,000,000 sq. miles. Some of the general features and relations of South America to North America are already described under America, but supplementary particulars are here given.

South America is united to North America by the Isthmus of Panamá. The coast-lines of South America, particularly the west, are comparatively little broken or interrupted by indentations, and in this respect resemble those of Africa. Toward the southern extremity is a group of islands, forming the archipelago of Tierra del Fuego. They are penetrated in every direction by bays and narrow inlets, ending often in glaciers. The mountainous and elevated tracts of the continent are chiefly limited to the borders of the Pacific and Atlantic oceans; the intervening space being occupied by a great series of plains, reaching from one extremity of the continent to the other, at an elevation generally less than 1000 feet above the level of the sea. There are four chief mountain systems, the most remarkable of which is the Andes, that stretch along the whole of the west coast from south to north for a distance of 4500 miles. They are of inconsiderable width comparatively, but attain great elevations, ranking in this respect next to the Himalaya mountains; the highest known peak, Aconcagua, in Chile, being 22,860 feet high. (See Andes.) The second system is that of Parima, also called the Highlands of Guiana, in the northeast; culminating point, Maravaca, about 10,500 feet high. The third system is near the north coast, and is known under the general name of the Coast chain of Venezuela; culminating point, the Silla de Caracas, with an elevation of 8600 feet. The fourth is that of Brazil in the southeast; culminating point, Itatiaia, 10,040 feet high. There are altogether upward of thirty active volcanoes in South America. They all belong to the Andes, and consist of three separate and distinct series; the series of Chile, of Peru and Bolivia, and of Quito. The loftiest is Gualateiri in Peru, which reaches a height of 21,960 feet. The immense plains are one of the remarkable features of South America, sometimes stretching for hundreds of miles without exhibiting the slightest perceptible inequality. They are variously designated, being known as pampas in the south, as selvas in the Amazon region, and as llanos in the north. All the South American rivers of any magnitude carry their waters to the Atlantic. The principal rivers are the Amazon, the Orinoco, and the Plata (which see), the first being the greatest as regards volume of water among the rivers of the world. One of the most singular features in the hydrology of



South America is the water connection existing between the Orinoco and the Amazon through the natural channel of the river Cassiquari. As explained under Brazil (which see) it would not be difficult to establish inland communication by water from the Orinoco to the Plata. The lakes of any considerable size are few; the largest, Lake Titicaca in the Andes, covers an area of above 4000 sq. miles. Naturally there are considerable diversities of climate in the different parts of the continent, but only in comparatively few are the extremes of heat and cold very great, and on the whole South America is neither very hot nor unhealthy, though so much of it is within the tropics. Over great part of it the rains are adequate, and in many parts abundant; but on the west coast there are small regions where rain seldom or never falls. The most distinguishing features of the vegetation of South America is its prodigious forests, which cover about two-thirds of the whole continent, and yield valuable timber, ornamental woods and dyewoods, cinchona, india-rubber, vegetable ivory, etc. In the tropical regions vegetation is on the grandest scale, grandeur also being combined with great beauty. Fruits abound, including oranges, limes, pine-apples, mangoes, bananas, pomegranates, and many others. Southward of the line coffee, sugar-cane, corn, and cacao are among the chief products. The most valuable vegetable products exported are coffee, cotton, wheat, and cacao. Among plants specially belonging to South America are cacao, cinchona, cocoa, and Paraguay tea. Among the domesticated native animals of South America are the llama and alpaca, both used as beasts of burden, and yielding a kind of hair which is exported and manufactured into tissues. Horses, at first imported, and cattle now roam wild over the southern plains. Large numbers of sheep are also reared, and wool, hides and skins, live animals, meat, etc., are now exported. Gold and silver, copper, nitre, guano, and precious stones are also products of South America. The aborigines of South America are undoubtedly of the same race as those of North America, as there exists a very striking general physical resemblance between the native races throughout the whole of the American continent, from Cape Horn to Bering's straits. (See America and Indians.) They are almost all of a copper color, with long black hair, deep-set black eyes, aquiline nose, and often handsome slender form. In South America these red men are far more numerous than in North America, and though many are half-civilized, a greater number are in a state of barbarism. A considerable portion of the population also consists of persons of Spanish and Portuguese blood, and along with these a far greater number of mixed Indian and European blood, civilized, and forming an important element in the various states of the continent. To these are now being added considerable numbers of Spanish and Italian immigrants. South America comprises the republics of Colombia, Ecuador, Venezuela, Peru, Bolivia, Chile,

Argentine Republic, Brazil, Paraguay and Uruguay, besides the colonies of British, French, and Dutch Guiana and the Falkland Islands (British). The areas and populations are as follows:

	Area sq. m.	Pop.
Colombia	504,500	3,879,000
Ecuador	251,300	1,400,000
Venezuela	566,200	2,324,000
Peru	439,000	2,980,000
Bolivia	472,000	2,270,000
Chile	293,300	8,414,000
Argentine Republic.....	1,200,000	4,043,000
Paraguay	98,000	432,000
Uruguay	72,000	825,000
Brazil	3,124,000	16,930,000
British Guiana.....	109,000	281,000
French "	35,000	30,000
Dutch "	60,000	72,000
Falkland Islands.....	6,600	2,000
	7,230,800	38,882,000

The first discoverer of the continent of South America was Christopher Columbus, who reached the mouth of the Orinoco in his third voyage (1498). The adventurer who followed next was Alonzo de Ojeda, a Spaniard, who examined the coast of Venezuela. Ojeda was accompanied by Amerigo Vespucci, a native of Florence, who, on his return to Spain, published an account of his voyage, and whose name gradually came to be given to the continent. Brazil was discovered in 1500 by Vincent Yanez Pinzon, who explored the mouths of the Amazon. Later in the year Alvarez Cabral reached the coast of Brazil farther south than the point touched by Pinzon, and took possession of the country in the name of the king of Portugal. In 1513 Vasco Nuñez de Balboa crossed the Isthmus of Darien, and discovered the Pacific ocean. In 1531 Pizarro embarked at Panamá with a small force, and made himself master of Peru. Almagro, a companion of Pizarro, pushed southward into Chile, and in 1537 the country between Darien and Peru was traversed by Vadoillo, and Quito was soon after taken possession of by the Spaniards. In 1540 Gonzales, the brother of Pizarro, crossed the Andes and came upon the Amazon, which Orellana, one of his officers, descended to the ocean. In the meantime Juan de Solis had discovered the La Plata in 1515, and Fernando Magellan sailed along the southeast coast and through the strait that bears his name into the Pacific (1520). In 1526 Sebastian Cabot ascended the Paraná and Paraguay, and established two or three forts, and in 1536 the city of Buenos Ayres was built. The discoveries of the Spanish and Portuguese gave the possession of almost the whole of South America to these nations—Portugal holding Brazil, while Spain, held the remainder. The colonial system of Spain was a highly vicious and oppressive one, and the colonies seized the first opportunity to cast off their allegiance to the mother country, early in the 19th century, when Spain was in difficulties from Napoleon's conquests. The Spaniards attempted to bring them back to their allegiance by force, and a series of struggles took place between the colonial and Spanish troops which lasted till 1824, when the independence of the colonies was finally secured.

SOUTHAMPTON, a borough and seaport town of England, in the county of

Hants, on a peninsula at the mouth of the Itchen, near the head of Southampton Water, 18 miles n.w. of Portsmouth, and 79 miles s.w. of London. There is ample dock accommodation, and Southampton is the most important mail-packet station in the kingdom. The manufactures are chiefly confined to brewing, coach-building, iron-casting, sugar-refining, and ship-building. Pop. 104,911.

SOUTH AUSTRALIA, a British colony forming the central of the three sections (running north and south), into which Australia is divided. Its length from north to south is 1850 miles; its breadth from east to west 650; its area 903,690 sq. miles. Pop. 500,000.

SOUTH BEND, the chief town of St. Joseph county, state of Indiana, on the St. Joseph river. It has important manufactures of wagons, buggies, agricultural implements, furniture, doors and window-frames, sewing-machines, paper, etc. It possesses two Roman Catholic colleges, the University of Notre Dame, etc. Pop. 43,100.

SOUTH BETHLEHEM, a town in Northampton county, Pa., 56 miles north by west of Philadelphia; on the Lehigh river, opposite Bethlehem, and on the Lehigh Valley and the Philadelphia and Reading railroads. South Bethlehem has large iron and steel manufactures, the principal being the large establishment of the Bethlehem Iron company. Pop. 16,164.

SOUTH BRIDGE, a town in Worcester county, Mass., 20 miles south by west of Worcester; on the Quinebaug river, and on the New York, New Haven and Hartford railroad. Pop. 11,643.

SOUTH CAROLINA, one of the original thirteen states of the Union, bounded on the north by North Carolina on the southeast by the Atlantic ocean,



Seal of South Carolina.

and on the southwest by Georgia. Area 30,570 sq. miles, and thirty-sixth in size among the states. South Carolina may be about equally divided into high, middling, and low land, the last named rising from the sea coast, where it is very flat and level, and gradually increasing in elevation toward the interior, where it attains a mean of about 250 feet, continuing to the north line, where, after varying from 300 to 800 feet, it reaches its highest elevation of 1000 feet. The land along and near the coast

is low, marshy, and swampy, especially on the rivers' banks, rolling and diversified toward the center, and undulating near the mountain slope, but in places abrupt, King's mountain rising almost perpendicularly 500 feet. The land is irrigated and well drained by numerous rivers, the largest of which is the Santee. The climate is mild, and especially healthful in the uplands and pine barrens, but unhealthful in the low swamp regions. Snow in measureable amounts generally does not fall on more than two or three days in a year, except in the mountains, where there is a considerable snowfall. The average annual rainfall is 47 inches, fairly evenly distributed both as to localities and seasons. Hurricanes visit the coast occasionally, and sometimes do considerable damage. In 1886 the state suffered from a severe earthquake which caused great destruction at Charleston. The palmetto, live oak, magnolia, long leaf pine, cypress, oaks, hickories are common. The persimmon, locust, and plane tree grow in this state. The most valuable minerals found are granite, gneiss, mica, slate, and rock phosphate. Gold and silver are

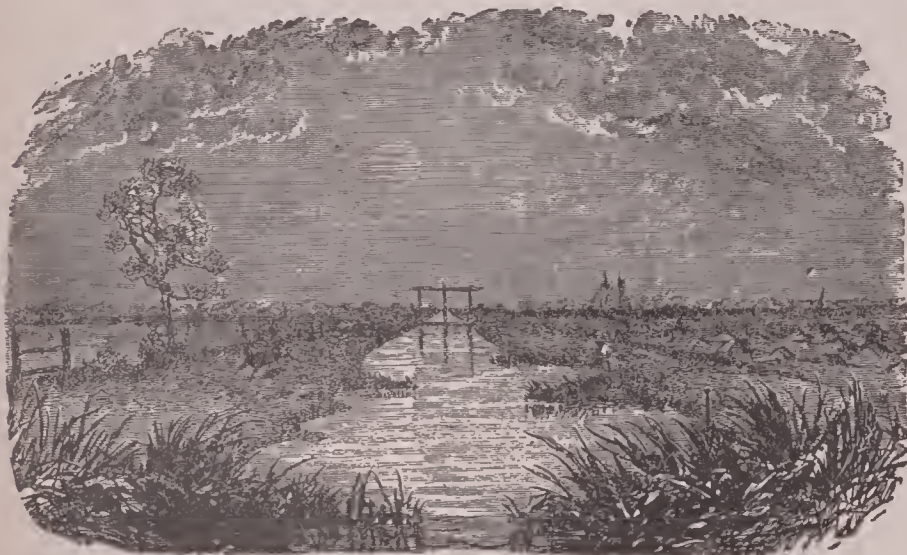
found in small quantities and the iron ores existing in large quantities are but little worked. The most important species in the fish industry of the state are oysters, whiting, shad, and sea bass. South Carolina ranks first among southern states and second in the Union in the value of its cotton products. Cotton seed oil and cake, planing mill products, flouring and grist mill products are among the other industries. The railroads are mostly owned or controlled by three large systems—the Southern, the Seaboard Air line and the Atlantic coast line. A considerable foreign trade, principally exports, passes through the port of Charleston, which ranks tenth among the Atlantic coast ports. Corn, wheat, oats, rice, and hay are the principal crops. Tobacco is grown in small quantities. Dairy cows, horses, mules and asses and swine are raised. The state provides higher education for both sexes at the South Carolina college located at Columbia. Of the nine colleges and seminaries for

females Converse college, a non-sectarian institution at Spartanburg, is the largest. The state has an agricultural college at Clemson college, at which also courses in civil, electrical, mechanical, and textile engineering are given. The negro population of South Carolina is greatly in excess of the white and consequently is one of the most serious of the educational problems. That considerable success has been attained is shown by the decrease in illiteracy. In 1562 Jean Ribault, acting for Admiral Coligny, attempted to form a colony of French Huguenots at Port Royal. In 1670 three shiploads of English settlers under William Sayle landed near Port Royal. In 1680 the settlement was removed to the present site of Charleston. The colony was divided into North and South Carolina in 1710. The colony joined Oglethorpe's unsuccessful expedition against the Spaniards in 1710. The colony was prompt in its resistance to the Stamp Act, and troops were quartered in Charleston. Famous leaders of irregular bands of patriots were Sumter and Marion. Charleston was captured by

loss of more than 1000 lives. In 1901-02 the South Carolina Interstate and West Indian exposition was held at Charleston. In national elections the state has been democratic, except in 1792. The largest cities are Charleston, Columbia, Greenville. Population of state about 1,490,000.

SOUTH CAROLINA COLLEGE, a non-sectarian, coeducational college in Columbia, S. C., chartered in 1801 and opened in 1805. It was closed in 1863 and was reopened in 1866 as the University of South Carolina. It was divided into two branches in 1878; one, the South Carolina college, the other Claflin college, for negroes, at Orangeburg. In 1894 women were admitted to all courses. It has a system of accredited schools, the certificate of which admits students without examination. The college has a department of law.

SOUTH DAKOTA, a north central state of the Union bounded on the north by North Dakota, on the east by Minnesota and Iowa, on the south by Nebraska, and on the west by Wyoming and Montana. The area is 77,650 sq. miles, of which 76,850 are land surface, and ranks twelfth in size among the states. In general the face of the country is like that of North Dakota; but west of the Missouri river the level and rolling portions rise to numerous hills, and buttes, and terminate in the rugged elevated, mineralogically rich Black Hills. The state is divided into the Missouri, Big Sioux, James, and Central Dakota valleys, and the Sioux reservation and Black Hills regions. The Missouri river flows through the state from about the center of the northern boundary to the extreme southeastern corner and forms the southern boundary for about 200 miles. The Big Sioux valley lies in the eastern and southeastern parts of the state. South Dakota has a climate with great extremes of temperature, the mean annual temperature is 44.3° F. The mean for January is 15° and for July 72.2°, while the absolute extremes may rise to more than 115° above or fall to more than 40° below zero. But owing to the dryness of the atmosphere, the heat and cold are much more endurable than more moderate temperatures and renders the climate bracing and pleasant. The soil in the greater part of the state is of excellent quality, and when sufficiently watered is rendered highly productive. The state is as a whole a treeless prairie country. Forests are found only in the Black Hills above an altitude of 4000 feet, where there is a good growth of pine. The mineral wealth of the state lies chiefly in the area of the Black Hills which is noted for the richness, abundance, and diversity of its resources, there being deposits of copper, gold, silver, argentiferous lead, iron ores, manganese, nickel, tin, mica, and some graphite. The clays contain beds of gypsum, and beds of lignite as well as reservoirs of natural gas. South Dakota ranks among the first wheat states in the Union. Corn, oats, barley, hay, and forage and potatoes are the other principal crops. The state has excellent grazing facilities. The number of cattle has increased over one hundred per cent and there has also been a large



A rice-field in South Carolina.

the British in 1780, and held until 1782. The state adopted the Federal constitution May 23, 1788, Columbia was made the capital in 1790, and a new constitution was adopted which gave the legislature practically all power. On the election of President Lincoln in 1860, a convention was called on December 20th, which unanimously passed an ordinance of secession. The attack on Fort Sumter in April, 1861, precipitated the civil war. The state furnished 60,000 soldiers to the confederate armies. The state suffered greatly from Sherman's march and during the war it was the scene of active operation between the federal and confederate armies. On the refusal of the state to ratify the fourteenth amendment, a military government was established. In 1868 another constitution allowing negro suffrage was adopted and the state was readmitted June 25th. A severe earthquake destroyed property valued at \$5,000,000 August 31, 1886. In 1893 a great storm on the coast caused the

increase in the number of horses, sheep, and swine. The railroads are confined to the region east of the Missouri river and to the mining region in the south-west corner. The Chicago, Milwaukee and St. Paul, the Great Western, and the Chicago and Northwestern have the greatest mileage. Much interest has been taken in the cause of education, during the entire time of South Dakota's statehood, and the advances made have been rapid indeed. There are normal institutions in every county. The leading educational institution in the state is the University of South Dakota. Among the more important colleges are Black Hills college at Hot Springs, Dakota university at Mitchell, and Pierre university at East Pierre. The state maintains a School of Mines at Rapid City, and the State Agricultural college at Brookings. There are charitable institutions and libraries in most of the



Great seal of South Dakota.

larger cities. The first real and permanent white settlement in Dakota was probably established by French-Canadians near Pembina about 1780. There were fur-trading posts established as early as 1808. By a treaty with the Dakota Indians in 1851 a large part of the country was opened to white settlement. The territory was established and organized in 1861. Yankton was the capital until 1883, when Bismarck became the seat of government. During the congressional session in 1888-89 provision was made to admit it into the Union as two states, North Dakota and South Dakota. In national elections the state has been Republican, excepting in 1892, when it went Democratic. Pop. about 490,000.

SOUTH DAKOTA, University of, a coeducational state institution at Vermillion, S. D., organized in 1882. The university has established a loan fund for the assistance of needy students. Military science and tactics form part of the course. The degrees conferred are those of Bachelor of Arts, Law, Commerce, and Music. The institution carries on the state geological survey.

SOUTHERN CROSS, a constellation of the southern hemisphere, composed of four stars, one of which is of the first, and two of the second magnitude. They form a figure not unlike a cross, especially when seen above the pole, and are the best-known of the southern constellations.

SOUTHEY (sou'thi), Robert, an English poet and miscellaneous writer, was

born in 1774. He left Oxford in 1794, and having formed an acquaintance with Coleridge, they were married on the same day to two sisters in 1795. Among his poetical productions may be mentioned—Joan of Arc; Thalaba; Madoc; The Curse of Kehama; Roderick, the Last of the Goths; a Poet's Pilgrimage to Waterloo; and a Vision of Judgment. Several of his minor pieces show to more advantage than his larger poems. His prose works are remarkable for their excellent style. Among others may be mentioned his Life of Nelson, which is almost a perfect model of its kind; Life of Wesley, History of Brazil, The Book of the Church, and the Doctor. He died in 1843.

SOUTH OMAHA (ō'mā-ha), a city in Douglas county, Neb., adjoining Omaha; on the Missouri river, and on the Union Pacific, the Chicago, Rock Island and Pacific, the Burlington and Missouri river, and other railroads. South Omaha was settled in 1882 and was incorporated in 1886. Its rapid growth dates from the establishment in 1884 of the Union Stock Yards. Pop. 30,000.

SOUTH POLAR EXPEDITIONS, exploring expeditions in the Antarctic regions. The first discovery of land in the proximity of the Antarctic circle was made accidentally by Dirk Cherrits, a Dutch navigator, who, in endeavoring to enter Magellan's straits, was driven southward to lat. 64°, where he discovered the South Shetland islands. Captain Cook is the first who is known to have sailed within the Antarctic circle. He reached the southernmost point attained by him on 30th January, 1774, in 71° 10' s. and 107° w. In 1821 the Russian Bellinghausen discovered Peter the Great and Alexander islands. Enderby Land and Kemp Land were discovered by Biscoe in 1831-33. The first of these is the easternmost point of a supposed continuous coast, and lies in lat. about 67° 30'. Sabina Land and Balleny islands were discovered in nearly the same latitude by Balleny in 1839. In 1840 two important exploring expeditions, one French, the other American, reached the southern seas. The French expedition, under Dumont d'Urville, found traces of what they believed to be a continuous coast from 136° to 142° e., to which they gave the name of Adélie Land. The American expedition, under Wilkes, passed very near the southern magnetic pole, the position of which at the time he calculated to be lat. 70° s., lon. 140° e., and traced land from lon. 154° 27' to 97° 30' e., which Wilkes concluded to be continuous. An English expedition under James Clark Ross in 1839 passed the Antarctic circle about lon. 178° e., and in 172° 36' e. lon. and 70° 41' s. lat. found a continuous coast trending south, with mountain peaks 9000 to 12,000 feet in height. He gave the country the name of South Victoria Land. In 77° 32' s. lat., 167° e. lon., he discovered an active volcano, Mount Erebus, 12,400 feet high. The farthest south point reached by Ross was 78° 10'; in 1899 M. Borchgrevink reached lat. 78° 50', and located the south magnetic pole in lat. 73° 20' s. and lon. 146° e. In 1901 several expeditions,

including a British one on board the Discovery, set out for the Antarctic regions. The southern polar region is much colder than the northern. The only mammals found are seals and cetaceans. No vegetation has been found further south than Cockburn island in the South Shetland group. See Polar Expeditions.

SOUTH SEA BUBBLE, a disastrous financial speculation which arose in England in the beginning of the 18th century. It originated with the directors of a joint-stock company, which, in consideration of certain exclusive privileges of trading to the South seas, offered the government easier terms for the advance or negotiation of loans than could be obtained from the general public. In 1720 the proposal of the company to take over the entire national debt (at this time about \$155,000,000) in consideration of receiving annually 5 per cent was accepted, and the company promised in return for this privilege (as it was regarded) a premium in their own stock of \$37,500,000. Professing to possess extensive sources of revenue the directors held out promises to the public of paying as much as 60 per cent on their shares. It soon became apparent that such magnificent promises could never be fulfilled, and in a few months' time the collapse came which ruined thousands.

SOUTH SEA ISLANDS. See Polynesia.

SOUTHWARK (south'ark), a division of London south of the Thames, in Surrey, a metropolitan parl. and mun. borough, directly opposite the City of London. For parliamentary purposes it is divided into three divisions—West Southwark, Rotherhithe, and Bermondsey, one member to each. Pop. parl. bor., 214,085.

SOUVALKY, a town of Russian Poland, capital of the government of the same name, with considerable trade, some manufactures, and a population of 66,533.

SOVEREIGN, the person in whom is vested the highest governing power in a state.

SOVEREIGN, a gold coin, the standard of the English coinage. It exchanges for \$4.80 and has a standard weight of 123.274 grains, being of 22 carats fineness, and coined at the rate of 1869 sovereigns from 40 lbs. troy of gold.

SOWING-MACHINES, machines for sowing grain. Among the simplest and earliest forms of sowing-machine is a cylindrical vessel with small holes at regular intervals round its circumference for sowing round seed, such as turnip seed. The machine is placed on wheels, and drawn over the land at a regulated speed, when by its mere revolution the seed is delivered with tolerable uniformity. Another class of machines consists of those having a fixed seed-box, the delivery from which is regulated by internal revolving machinery. The holes for delivery are placed at regular intervals near the bottom of one side of the seed-box. One of the best modes of delivery is regulated by cups attached to projecting arms on a revolving disc. The cups dip into the seed and lift successive portions, which they deliver at the height of their revolution into a funnel placed for its

removal to the ground. Another mode of delivery is by an oscillating movement given to a false bottom of the seed-box. The real and the false bottom are both provided with holes, and when the holes correspond the seed falls. An objection is made to these machines that they are liable to cut the seed. In broadcast machines no special apparatus is needed for conveying the seed to the ground, the intervals of the holes causing it to fall evenly on the ground. In the machines called drills the funnel into which the seed is dropped is designed to convey it accurately into the row in which it is to be sown, the rows being parallel to the course of the machine. For this purpose the funnel terminates in a heavy coulter, which opens a channel of uniform depth for the deposit of the seed, which is then covered by a harrow. By further improvements drop drills and dibbling machines have been contrived, which not only deposit the seed in rows but at regular intervals within the rows. The regular delivery of manure is also secured by similar machines.

SPACE, in philosophy, extension considered independently of anything which it may contain, extension considered in its own nature. Aristotle defines it as the possibility of motion, and possessing the quality, therefore, of being—potentially, not actually—divisible ad infinitum. Space and Time are two of the so-called innate ideas. According to one school these ideas are intuitive to the mind; according to another they are the result of experience. Locke maintained that we acquire the idea of space by the senses of sight and touch. Space and Time, according to Kant, are the ultimate forms of external and internal sense, and these forms are contained a priori in the human mind. Space is the form of external sense by means of which objects are given to us as existent without us, and as existent also apart from and beside one another. If we abstract from all that belongs to the matter of sensation (in any perception), there remains behind only space, as the universal form into which all the materials of the external sense dispose themselves. Herbert Spencer, while making no attempt to analyze the notion of space, says: "It will be sufficient for present purposes to say that we know space as an ability to contain bodies. I am aware that this is no definition properly so called, seeing that as the words 'contain' and 'bodies' both imply ideas of space, the definition involves the thing to be defined. But leaving out as irrelevant all considerations of the mode in which we come by our ideas of space, and of bodies as occupying space, it will I think be admitted that the antithesis between bodies and an ability to contain bodies truly represents the contrast in our conceptions of the sensible non-ego (matter) and the insensible non-ego (space)."

SPADIX, in botany, a form of the inflorescence of plants, in which the flowers are closely arranged round a fleshy radius, and the whole surrounded by a large leaf or bract called a spathe, as in palms and arums.

SPAIN, a state in the southwest of Europe, forming with Portugal the

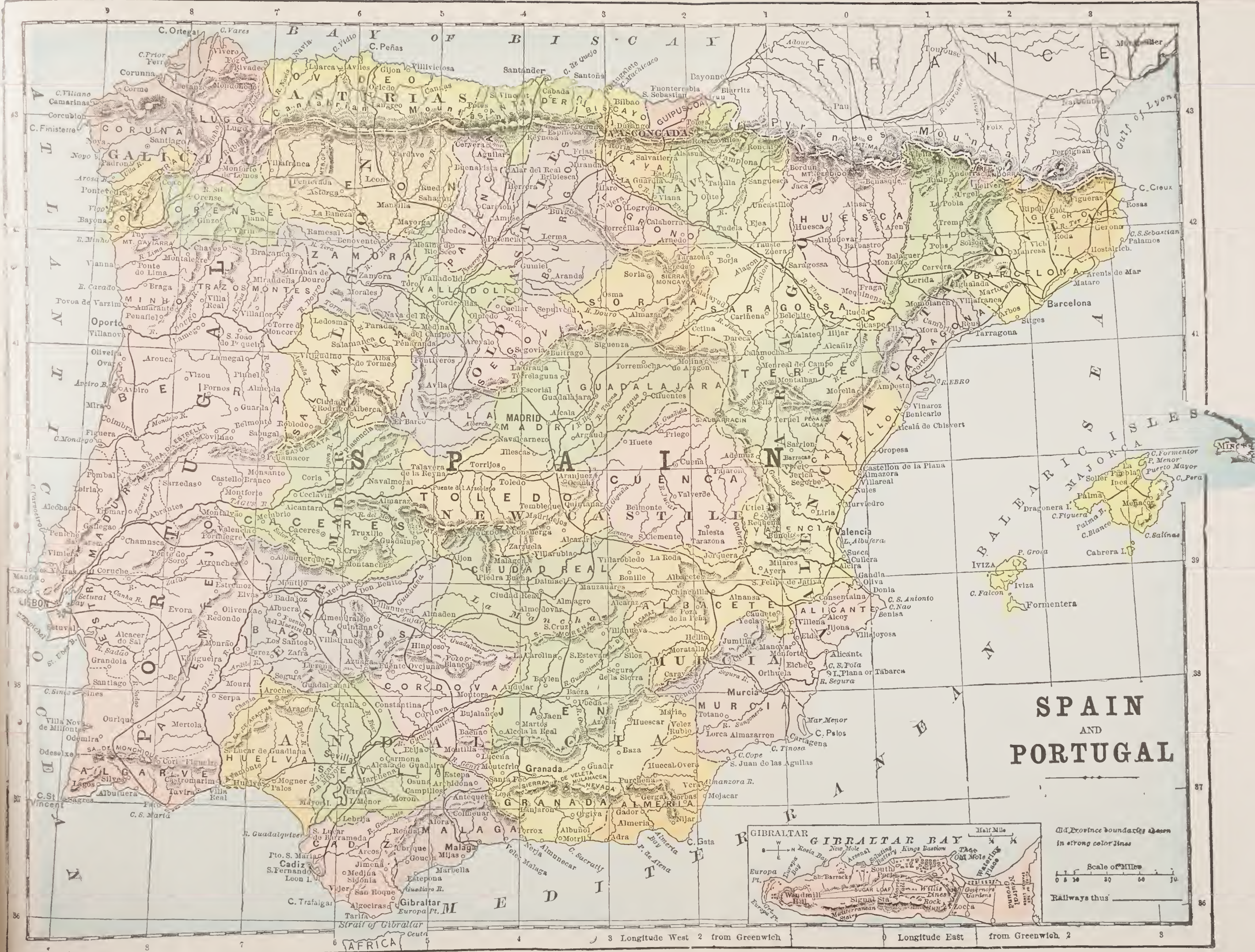
great southwestern peninsula of Europe. It is separated from France on the northeast by the chain of the Pyrenees, and is otherwise bounded by Portugal and the Atlantic and Mediterranean. In greatest breadth n. and s. it measures 540 miles; greatest length e. and w., 620 miles; total area, 196,000 sq. miles; pop. 18,089,500. Besides the Balearic and Canary Islands, Spain retains of her colonial possessions a large strip on the west coast of the Sahara; and the island of Fernando Po, with some smaller West African possessions. Their total area is about 244,000 sq. miles; pop. about 144,000. Spain formerly comprised the ancient kingdoms and provinces of New and Old Castile, Leon, Asturias, Galicia, Extremadura, Andalusia, Aragon, Murcia, Valencia, Catalonia, Navarre, and the Basque provinces. These since 1834, for administra-



a, Spathe. b, Spadix.

tive purposes, have been divided into forty-nine provinces, including the Balearic and Canary islands. The capital is Madrid; next in population are Barcelona, Valencia, Seville, and Malaga. The coast-line is not much broken, but sweeps round in gentle curves, presenting few remarkable headlands or indentations. The interior is considerably diversified, but its characteristic feature is its central table-land, which has an elevation of from 2200 to 2800 feet, and a superficial extent of not less than 90,000 sq. miles. It is bounded on the n. by the Asturian and Cantabrian mountains; on the s. by the Sierra Morena; and is crossed from east to west by the rivers Douro, Tagus, and Guadiana. Between these limits it is intersected by two important ranges of mountains running nearly e. and w., the northern being the Guadarrama with its continuations, separating the valleys of the Douro and Tagus; and the southern, the Sierra de Toledo and its continuations between the Tagus and the Guadiana. South of the Sierra Morena is the valley of the river Guadalquivir. Besides these ranges there is the chain of the Pyrenees, which, though partly belonging to France, presents its boldest front to Spain and has its loftiest summits within it. The chief rivers enter the Atlantic, but in the northeast is the Ebro, a tributary of the Mediterranean. The Douro, Tagus, and Guadiana belong partly to Portugal. The lakes are few and unimportant. The whole country teems with mineral wealth, the minerals, including in greater or less quantities gold, silver, quicksilver, lead, copper, iron, zinc, calamine, antimony, tin, coal, etc. The climate varies much in different localities. On the elevated table-land

it is both colder in winter and hotter in summer than usual under the same latitude. In the plains and on the coasts the hot summer is followed by a cold rainy season, terminating in April in a beautiful spring. The mean temperature at Malaga in summer is 77° F., in winter 57°; at Barcelona 77° and 50°; and at Madrid 75° and 44.6°. The rainfall is small; in the interior between 10 and 12 inches per annum. In some parts of the south the climate is almost tropical. About one-sixth of the acreage is under wood; the more remarkable trees being the Spanish chestnut and several varieties of oak, and in particular the cork-oak. Fruits are extremely abundant, and include, in addition to the almond, date, fig, orange, citron, olive, and pomegranate; and in the lower districts of the south, the pine-apple and banana. The more important farm crops are wheat, rice, corn, barley, and legumes. In the south cotton and the sugar-cane are grown. Hemp and flax, the mulberry for rearing silk-worms, saffron, liquorice, are also to be mentioned. The only large animals in a wild state are the wolf, common in all the mountainous districts, and the bear and chamois, found chiefly in the Pyrenees. Domestic animals include the merino sheep in great numbers, horses, mules, asses, horned cattle, and pigs. The manufactures of Spain are not as a whole important, but considerable advances have been made in recent times. The most important industries are the manufactures of cotton, of woollens and linens, of cutlery and metal goods, paper, silk, leather, tobacco and cigars, besides wine, flour, and oil. The chief articles of export are wine, fruits (especially oranges and raisins), cork, lead, copper and copper ore, iron ore, oils, soap, and agricultural produce (including cattle and wool). The chief trade is with France, next to which is Britain. The country is imperfectly provided with roads; the rivers are of little use for navigation; and though railways have a considerable aggregate length (about 6000 miles), much is still required. The length of telegraphs is about 11,500 miles. The chief denomination of money is the peseta, of which about 5 are equivalent to \$1.00. The present constitution dates from 1876, and enacts that the government be a constitutional monarchy, the legislative power resting "in the Cortes with the king," the executive being vested, under the monarch in a council of nine ministers. The Cortes consists of two independent bodies—the senate and congress, the former consisting of 360 members, one half of whom are elected by corporation and similar bodies, the other half being life senators nominated by the crown and "senators by their own right." The congress is formed by deputies in the proportion of one to each 50,000 of the population. The various provinces, districts, and communes are governed by their own municipal laws with local administration. Each commune has its affairs directed by an elected ayuntamiento, and each province has a diputacion provincial, or parliament, whose members are elected by the ayuntamiento. The army consists



SPAIN AND PORTUGAL



Old Province boundaries shown
in strong color lines

Scale of Miles
0 10 20 30 40

Railways thus

Longitude West 2 from Greenwich Longitude East from Greenwich 2

(1) a permanent army, in which all above the age of twenty are liable to serve for three years; (2) an active reserve with three years' service; and (3) a sedentary reserve, with service for other six years. By the payment of \$300 exemption from service may be obtained. For military purposes the country, with the islands, is divided into fourteen districts, and the strength of the army (exclusive of the reserve) is 130,000 in peace and 310,595 in war. The navy is manned by about 6000 men, besides about 9000 marines; the vessels comprise four battle-ships, three first-class protected cruisers, three second-class, and a large number of third-class and gunboats, etc. The people of Spain are of very mixed origin, the most ancient inhabitants, the Iberians (now represented probably by the Basques or Biscayans of the northeast), being afterward mingled with Celts, Phœnicians, and Carthaginians, Roman colonists, Goths, Jews, and Arabs or Moors. They are generally of medium height and of spare habit, with black hair, dark eyes, and sallow complexion. Under the constitution the state binds itself to maintain the Roman Catholic religion, but a restricted liberty of worship is permitted to Protestants, of whom, however, there are very few. The most ancient known inhabitants of Spain were the Iberians. To these afterward were joined certain tribes of Celts, and subsequently the two races united. The Phœnicians made settlements at a very early date, having founded Cadiz about B.C. 1100; later the Greeks founded several cities, and when (B.C. 238), the history of Spain may properly be said to begin with the Carthaginian invasion. Hamilcar Barca undertook, with considerable success, to subjugate the tribes of the peninsula, and in this effort he was followed by Hasdrubal and Hannibal. War between Rome and Carthage brought the Romans to Spain, and (B.C. 205) ended in their driving out the Carthaginians. In 256 A.D. the country was invaded by the Franks, and after their departure Spain became peaceful until the advent of the Goths. A Visigothic kingdom was established about 418 A.D. But after retaining the mastery of the country for nearly three centuries the Visigoths were in their turn conquered (711 A.D.) by the Saracens under Tarik, and the greater part of Spain became a province of the caliphs of Bagdad. For some years they held it as a dependency of the province of North Africa, but it was afterward (717) governed by emirs appointed by the caliphs of Damascus. Dissensions ultimately arose between the central power and the province, with the result that an independent dynasty was established by Abd al-Rahman at Cordova (756 A.D.), which received additional power and magnificence from Hisham (788) and his son Al Hakam (796). Meanwhile several small kingdoms had been formed in the mountainous districts of the Pyrenees, probably by descendants of the Visigoths. The chief of these were the kingdoms of Asturias, Leon, Navarre, Aragon, and Castile. These states were often at war with each other, and in the struggle for supremacy Castile and Aragon ultimately absorbed

all the others. By the marriage (1469) of Isabella, the heir to the crown of Castile with Ferdinand of Aragon, begins the modern history of Spain. To strengthen the central government and curtail the power of the nobility the Santa Hermandad, or Holy Brotherhood, was formed (1476) to act as the administrators of justice; the Inquisition was instituted (1481) to promote religious orthodoxy and unity; the Jews were expelled for heterodoxy; and the Moors were completely subjugated by the conquest of Granada (1492) and afterward expelled. In this same year Columbus discovered the West Indies, and the colonial power of Spain, thus begun, was soon greatly extended. When Ferdinand died in 1516 his daughter Joanna, who had married Philip, son of Maximilian I., succeeded to the kingdom of Aragon, but her son, Charles I., became regent and ultimately king of the whole of Spain. He was also ruler of the Netherlands, which he inherited from his father, and in 1519 he was proclaimed Charles V. emperor of Germany. As the champion of the Catholic church he successively declared war with the French, the German Protestants, and the Turks. But as the expense of this vast policy overtaxed his own kingdom and was only partially met by the wealth acquired by the conquest of Mexico (1518) and Peru (1531), he finally retired in despair, and was succeeded (1556) by his son, Philip II., who failed to establish the Spanish influence in France and sustained defeat from England by the destruction of the Invincible Armada. He was succeeded (1599) by Philip III., who, by expelling all the Moriscos from his kingdom and engaging in the Thirty Years' war, impoverished the country. Further disasters overtook Spain on the accession of Philip IV. (1621). Under his son, Charles II. (1665), a prince who was feeble both in mind and body, the country declined still more, and at his death in 1700 without an heir there began the war of the Spanish succession. After a prolonged European war it was agreed by the Treaty of Utrecht (1713) to acknowledge the Bourbon Philip V. as king of Spain on condition that the Netherlands and the Italian provinces were given to Austria, while England claimed Gibraltar and Minorca. Under the administration of Cardinal Alberoni Spain regained a large part of its power in Europe. This revival was continued under Ferdinand VI., who succeeded to the throne in 1746; but it received its greatest impulse from Charles III. (1759), who developed the agricultural and other resources of his country, and broke the power of the Inquisition by banishing the Jesuits (1767). The full effect of these and other liberal measures was arrested, however, by the accession of Charles IV. (1788), whose policy, directed by Godoy, first brought about a rupture with the French republic, and then a close alliance with France and a war against the British, resulting in the battle of Trafalgar (1805), when the naval power of Spain was destroyed. The result was an insurrection and the abdication of the king (1808) in favor of his son, Ferdinand VII. Napoleon

caused the whole Bourbon family to be set aside and gave the crown to Joseph, his brother. War was declared and the council entered into an alliance with Great Britain. In several battles the British army routed the French and advanced into Spain; but it was not until the spring of 1813 that Wellington was able to clear the peninsula of French soldiers and to fight his way through the Pyrenees into France. In consequence of this success the Bourbon prince, Ferdinand VII., returned and was proclaimed king (1814). During the Napoleonic war the South American colonies had asserted their independence, Florida had been sold to the United States, and the finances misused. In 1829 Ferdinand abolished the Salic law by a "pragmatic sanction," and as the result of this his daughter was proclaimed queen, on the death of her father in 1833, under the title of Isabella II. As this queen was only three years old, her mother, Maria Christina, undertook the regency; but she was opposed by Don Carlos, a brother of the late king, and a serious civil war broke out. The Carlist party achieved considerable success at first, but the civil strife was ultimately brought to an end by the triumph of the royalists (1840) under Espartero and O'Donnell. Notwithstanding this the regent, who found it impossible to control the various factions, retired into France, and Espartero was recognized as regent. By the influence of Louis Philippe, the French king, a marriage was brought about in 1845 between Isabella and her cousin, Don Francisco d'Assiz. For some years after this event the political history of Spain became a medley of party intrigue and petty political and military revolution. In 1873 the cortes declared in favor of a federal republic, and the presidency was intrusted to Castelar; but the outbreak of a Carlist war in the Basque provinces made this form of government impossible. Accordingly as it had been proved that a republican form of government was impossible, the throne was offered (1874) to the son of the exiled Isabella. In 1875 the young king, with the title of Alfonso XI., landed at Barcelona, and successfully established his government by a complete defeat of the Carlist insurgents. The present king is his son, Alfonso XII., who was crowned in 1902. The chief event in the recent history of Spain is the war with the United States (1898), which stripped her of her richest remaining colonies: Cuba, Porto Rico and the Philippines. In 1906 Alfonso married the English princess Victoria Ena, daughter of Princess Beatrice. In June, 1907, an heir to the throne was born. The Spanish language, which is also the language of Mexico and a great part of South America, belongs to the group known as the Romance or Romanic languages. Its formation was influenced by the lengthened duration in Spain of Roman institutions, by the Teutonic element introduced by the Visigoths, and by words of Arabic origin added during the long occupation of the country by the Moors. The national literature of Spain dates from the 12th century, ballads and metrical romances being its earliest prod-

ucts. To this period the Poema del Cid is usually ascribed, an epic in which are narrated the adventures of Rodrigo Diaz de Bivar, the national hero. Following this early historical and legendary theme came the didactic verse of the Benedictine monk Gonzalo Berceo (1198-1268). The most remarkable piece of writing of this age was *Las Siete Partidas* (1265), a Castilian code of laws published under the patronage of Alfonso X. In the 16th century there were published the *Amadis de Gaula*, the first of the Spanish caballerias, or "books of chivalry." It was not, however, until the kingdoms of Castile and Aragon were united under Ferdinand and Isabella that Spanish literature attained its chief distinction. The principal writers were Juan Boscan Almogaver, Diego de Mendoza, Garcilaso de la Vega, Fernando de Herrera, and Hernando de Acuña. Characteristic of this period was the vigorous development of the novela, with a picaresque or rogue for hero. The earliest of these picaresque novels was *Guzman de Alfarache*, by Mateo Aleman; *Alonzo Mozo*, by Geronimo de Alcalá; *Gran Tacaño*, by Quevedo, and numerous other romances. But these were all surpassed, and the chivalric extravagance of this period burlesqued to extinction by *Don Quixote* (first part 1605), the masterpiece of Miguel Cervantes de Saavedra. But this movement received its full perfection and refinement in the poetical and philosophical dramas of Pedro Calderon de la Barca (1600-81). Among the historical writings of this era were the *Historia de España*, by Juan de Mariana; *Guerra de Granada*, by Diego de Mendoza; the *Historia Verdadera de la Conquista de la Nueva España*, by Bernal Diaz del Castillo; and the *Historia de las Indias*, by Bartolomé de las Casas. With the accession of the Bourbons in the 18th century there was introduced from France an element of revival into Spanish literature which was furthered by the *Poetica* of Ignacio de Luzan, the *Retorica* of Gregorio de Mayans, and the *Teatro Critico* of Benito Feyjoo. This French element had also its influence upon the poets of the latter half of the 18th and beginning of the 19th centuries, among whom were Valdes, Cienfuegos, Iriarte, Gonzales, Moratin, de la Rosa, etc.; while the romance was revived in the *Fray Gerundio* of José de Isla, who was also the translator of Gil Blas. The romantic movement of France had its Spanish adherents, among whom, as the most notable poets, are to be named Zorrilla, Espronceda, Diaz, Escosura, and Pacheco; the chief classicists being Quintana, Reinoso, Calderon, and Carvajal; while as a satirist, José de Lara (Figaro), and as a dramatist Manuel Breton de Herreros, are worthy of mention. More recently the poets Campoamor, Arce, Becquer, de Trueba, and Aguilera, and the novelists Caballero, Valera, Galdos, de Trueba, Gonzales, and Alarcon have attained a certain distinction.

SPANGLES, metal ornaments, used chiefly for theatrical dresses, and consisting for the most part of thin circular pieces of gilt or silvered tin.

SPANISH AMERICAN WAR, the war

between Spain and the United States in 1898. The struggle between the Cubans and their home government for over a century, the increase of bloodshed, starvation and general devastation of the island, the systematically disregarded rights of American citizens by the Spanish authorities, finally decided the United States to interpose its friendly offices. President Cleveland, in December, 1896, in his annual message, spoke of "higher obligations" than those due to Spain, which would devolve upon the United States if conditions should grow worse in the island and if Spain's inability to deal successfully with the insurrection should become manifest. On the evening of February 15th the battleship *Maine* was blown up in Havana harbor and 266 of the crew killed. Congress immediately appropriated \$50,000,000 for national defense. Public opinion decided that the Spanish officials in Cuba were responsible for the disaster. On April 23d President McKinley called for 125,000 volunteers and ordered the North Atlantic squadron to blockade Havana and other Cuban ports. Formal declaration of war by Spain on the 24th and by the United States on the 25th inst. were followed by the proclamations of neutrality by Great Britain and other foreign powers. The first act of war was the capture, April 22, of the merchantman *Buena Ventura*, by the gunboat *Nashville*. On April 24 Dewey, with orders to capture or destroy the Spanish fleet in the Philippines, set sail from Hong Kong. April 25, the Spanish forts opened fire upon the American fleet off Havana. April 27, the earthworks of Matanzas were shelled; the Spanish steamship *Guido* was taken and the enemy's fleet gathered in Manila bay to meet Dewey. April 29, *Cienfuegos* was bombarded and Cervera's fleet made its first start for Cape Verde islands. May 1 came the victory of Dewey when he destroyed the Spanish fleet of 11 warships in Manila bay and subsequently took possession of Cavite. May 19, the Cape Verde fleet was reported at Santiago. June 3, Lieut. Hobson, with seven volunteers, sank the *Merrimac* in the entrance to the harbor of Santiago, one of the most thrilling performances of the war. June 21, Gen. Shafter's troops arrived off Santiago and landed at Baquiri, June 23. July 1, the assault upon Santiago began, when El Caney and San Juan were taken with heavy losses. July 3, Cervera's Cape Verde fleet was destroyed while making a dash to escape from Santiago harbor. Commodore Schley was acting-admiral in the absence of Admiral Sampson. July 14, Gen. Toral, commanding the Spanish forces, surrendered Santiago and the east side of Cuba. July 25, Gen. Miles and the Porto Rico expedition began landing on that island. July 26, Spain formally sued for peace through the French ambassador. July 28, the city of Ponce surrendered to Gen. Miles, the inhabitants welcoming the invaders with shouts of joy. The president, July 29, named the conditions under which peace would be discussed and which were made public Aug. 2. These banished Spain entirely from this hemisphere;

gave the United States an island in the Ladrone group; also Luzon of the Philippines and the latter to be a further question in the later negotiations. August 6 it was announced that Spain accepted the terms proposed, and shortly afterward the peace protocol was signed in Washington; the French ambassador acting for Spain. Admiral Dewey and General Merritt, August 13, made combined attack on Manila, the result being its capture.

SPANISH AMERICAN WAR, 1898, Chronology of, *Maine*, blown up, February 15; Spain asked to leave Cuba, April 19; diplomatic relations broken, April 21; Cuban blockade declared, April 22; war declared by Spain, April 24; war declared by United States, April 25; Dewey's victory at Manila, May 1; Hobson's *Merrimac* exploit, June 3; United States army corps land in Cuba, June 21; battle at El Caney and San Juan, July 1; Cervera's fleet destroyed, July 3; General Toral surrenders, July 14; Santiago de Cuba surrenders, July 17; campaign in Porto Rico begins, July 25; peace protocol signed, August 12; surrender of Manila, August 13; peace treaty signed in Paris, December 12; signed by the president February 10, 1899; by the queen regent, March 17.

SPANISH MAIN, the name formerly given to the Atlantic ocean and coast along the north part of South America, from the Leeward islands to the Isthmus of Darien.

SPANKER, a large fore-and-aft sail set upon the mizzen-mast of a ship or barque, the top extended by a gaff, the



ss. Sparker.

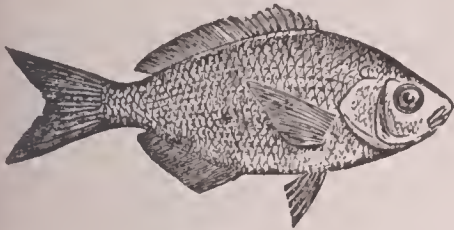
foot by a boom. It is also called the mizzen.

SPAR, in mineralogy, a term employed to include a great number of crystalized, earthy, and some metallic substances, which easily break into rhomboidal, cubical or laminated fragments with polished surfaces, but without regard to the ingredients of which they are composed. Among miners the term spar is frequently used alone to express any bright crystalline substance.

SPAR-DECK, nautical, a term somewhat loosely applied, though proper signifying a temporary deck, consisting of spars supported on beams, laid any part of a vessel. It also means the quarter-deck, gangways, and forecas of a deep-waisted vessel, and is applied to the upper entire deck of a double-banked vessel without an open waist.

SPA'RIDÆ, a family of acanthopterygious, teleostean fishes, of which

genus *Sparus* is the type. They somewhat resemble the perches in form, the body being generally of an ovate form and covered with large scales. The Sparidae are mostly inhabitants of warm



Sparada.

climates. They are edible, and some of them highly esteemed.

SPARKS, Jared, born at Willington, Connecticut, 1789; died 1866. He was educated at Harvard, where he became mathematical tutor, and he was subsequently (1819-23) pastor of a Unitarian church at Baltimore. He was afterward editor of the *North American Review*, and was appointed professor of history (1839) and president (1849) of Harvard. He is chiefly known in literature as the author of *Life and Writings of Washington* (twelve vols., 1834-37); *Diplomatic Correspondence of the American Revolution* (twelve vols., 1829-30); *Library of American Biography* (two series, 25 vols.); and *Works of Benjamin Franklin* (ten vols., 1836-40).

SPARROW, a well-known bird of the finch family, which inhabits the British islands and other parts of Europe, and has been introduced into North America and Australia. Their amazing fecundity, their strong attachment to their young, their familiarity, not to say impudence, and their voracity, are familiar to all. They often do great injury in cornfields, and gardens, but they also do great service in destroying grubs, caterpillars etc.

SPARROW-HAWK, the common name of several hawks. The male is colored dark brown on the top of the head, and on the upper aspect of the body and wings. The under parts are of a reddish-brown color, marked with



Sparrow-hawk.

narrow bands of darker tint. The female bird is of a duller brown hue on the back and head; and her plumage is diversified by numerous white spots. It is a bold, active bird, very destructive to pigeons, small birds and chickens.

SPARTANBURG, a city and capital of Spartanburg co., S. C.; on the Port Royal and W. Car. and the Southern railways; 73 miles w.s.w. of Charlotte,

N. C., 95 miles n.w. of Columbia, the state capital. It is in a gold and iron mining and limestone-quarrying region. Pop. 12,462.

SPASM, in medicine, an abnormal, sudden, and more or less violent contraction of one or more muscles or muscular fibers. Spasm is either clonic or tonic. In clonic spasm the muscles or muscular fibers contract and relax alternately in very quick succession, producing the appearance of agitation, as in epilepsy. In tonic spasm the muscles or muscular fibers contract in a steady and uniform manner, and remain contracted for a comparatively long time, as in tetanus.

SPAT'ULA, a flat sort of knife with a thin flexible blade, used by druggists, painters, etc., for spreading plasters, working pigments, etc. In surgery, it is a flat instrument, angular or straight, for depressing the tongue and keeping it out of the way in operations about the throat or larynx.

SPATULARIA, or **POLYODON**, a genus of fishes belonging to the sturgeon tribe. They are remarkable for the form



Spatularia, upper (1) and under (2) view.

of their snouts, which are enormously long and leaf-like in form. The type of the genus is the paddle-fish of the Mississippi.

SPAV'IN, a disease of horses, affecting the hock-joint, or joint of the hind leg, between the knee and the fetlock. It occurs in two forms. In the first, which is called bog or blood spavin, the joint is distended by joint-oil (synovia). In the other form there is a morbid deposition of body substance, such as to unite separate bones. It causes lameness, gradually growing worse until finally the various bones become to a great extent united and solidified by the mass of fibrous bone which grows over them. The disease is caused by strains.

SPAWN, the eggs or ova of fishes, frogs, etc., from which, when fertilized by the males, a new progeny arises that continues the species. In the oviparous fishes with distinct sexes the eggs are impregnated externally, and arrive at maturity without the aid of the mother. The spawn being deposited by the female, the male then pours upon it the impregnating fluid. In the ovoviviparous fishes sexual intercourse takes place, and the eggs are hatched in the uterus. Fishes exhibit a great variety in regard to the number of their eggs. In the spawn of a cod-fish, for example, no fewer than three and a half millions of eggs have been found. In general, before spawning, fish forsake the deep water and approach the shore, and some fish leave the salt water and ascend the rivers before spawning, and then return again.

SPEARMINT, a European and North American species of mint often cultivated for making sauce and in order to obtain a flavoring essence from it.

SPECIAL LICENSE. See Marriage.

SPECIES, as ordinarily defined, is any one group of animals or plants the members of which generally bear a close resemblance to each other in the more essential features of their organization, which produce fertile progeny, and which may, in the generality of cases, produce individuals varying from the general type of the group, the variation, however, being in all cases of a limited kind. Under this definition the various species, "kinds" of animals and plants, and their included varieties, used to be comprehended, while naturalists regarded species as unchanging throughout the longest succession of ages, except within narrow and marked limits. Thus Buffon defines a species as "a constant succession of individuals similar to and capable of reproducing each other;" and Cuvier as "a succession of individuals which reproduces and perpetuates itself." Since the publication, however, of Darwin's *Origin of Species* this conception has been greatly modified by the view that, as Haeckel defines it, "the species is the whole succession of organisms which exhibit the same form in the same environment." In this conception no absolute standard of what constitutes a species can be set up, nor can the number of species, especially among the transitional varieties of the lowest forms of life, be determined. In mineralogy, chemistry, and such sciences as relate to inorganic substances, species is regarded by some writers as being determined by identity of physical properties, as specific gravity, hardness, etc.; and by others, as constituted by chemical composition, the physical properties going for nothing. In scientific classification species unite to form groups called genera, which are included in orders, the orders forming classes, and so on.—Species in logic is a group of individuals agreeing in common attributes and designated by a common name; a conception subordinated to another conception, called a genus or generic conception, from which it differs in containing or comprehending more attributes, and extending to fewer individuals; thus "man" is a species under "animal" as a genus, and "man" in its turn may be regarded as a genus with respect to European, Asiatic, and the like.

SPECIFIC GRAVITY is the relative gravity or weight of any body or substance considered with regard to an equal bulk of some other body which is assumed as a standard of comparison. The standard for the specific gravities of solids and liquids is pure distilled water at the temperature of 62° Fahr., which is reckoned unity. By comparing the weights of equal bulks of other bodies with this standard we obtain their specific gravities. Thus the specific gravity of cast-iron is 7.21; that is, any particular mass of cast-iron will weigh 7.21 times as much as an equal bulk of water. The practical rule is, weigh the body in air, then in pure distilled water, and the weight in air, divided by the loss of weight in water will give the specific gravity of the body. In designating the specific gravities of gases the standard of unity is atmospheric air.

The specific gravity of various substances is as follows:

<i>Liquids.</i>		<i>Timber.</i>	
Water.....	100	Cork.....	24
Sea-water.....	103	Poplar.....	38
Dead Sea.....	124	Flr.....	55
Alcohol.....	84	Cedar.....	61
Turpentine.....	99	Pear.....	66
Wine.....	100	Walnut.....	67
Urine.....	101	Cherry.....	72
Cider.....	102	Maple.....	75
Beer.....	102	Ash.....	84
Woman's milk.....	102	Beech.....	85
Cow's milk.....	103	Mahogany.....	106
Goat's milk.....	104	Oak.....	117
Porter.....	104	Ebony.....	133
<i>Sundries.</i>		<i>Metals and Stones.</i>	
Indigo.....	77	Granite.....	278
Ice.....	92	Diamond.....	353
Gunpowder.....	93	Cast iron.....	721
Butter.....	94	Tin.....	729
Clay.....	120	Bar iron.....	779
Coal.....	130	Steel.....	783
Opium.....	134	Brass.....	840
Honey.....	145	Copper.....	895
Ivory.....	183	Silver.....	1,047
Sulphur.....	203	Lead.....	1,135
Marble.....	270	Mercury.....	1,357
Chalk.....	279	Gold.....	1,926
Glass.....	289	Platina.....	2,150

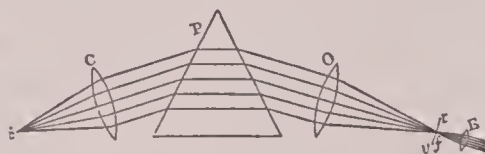
The weight of a cubic foot of distilled water at a temperature of 60° F. is 1,000 ounces Avoirdupois, very nearly, therefore the weight (in ounces, Avoirdupois) of a cubic foot of any of the substances in the above table is found by multiplying the specific gravities by 10, thus: one cubic foot of oak weighs 1,170 ounces; one cubic foot of marble 2,700 ounces, and so on. See Hydrometer.

SPECIFIC HEAT, is a term applied to the quantity of heat required to raise equal weights of different substances through equal intervals of temperature. Water is taken as the standard substance in measuring quantities of heat. The thermal capacity of unit mass of cold water is unity; and the number which denotes the thermal capacity of a body expresses the mass of water which has the same thermal capacity as the body. Thus the thermal capacity of unit mass of a substance is called its specific heat, and is identical with the ratio of the thermal capacity of any mass of the substance to that of an equal mass of water. The specific heats of the metals and of many other substances have been carefully determined, and are tabulated in all the larger books on heat.

SPECTACLES, a well-known and invaluable optical instrument supposed to have been invented by Roger Bacon in the 13th century, and used to assist or correct some defect in the organs of vision. Spectacles consist generally of two oval or circular lenses mounted in a light metal frame which is made up of the "bows," "bridge," and "sides." The lenses are usually bi-concave, bi-convex, or concavo-convex, though lenses forming segments of a cylinder are used in some cases of astigmatism. In long-sighted persons the defect of the eye is counteracted by convex lenses, in short-sighted persons by concave lenses. (See Sight.) Divided spectacles have each lens composed of two

semicircles of different foci nearly united one above the other; one half for looking at distant objects, and the other for examining things near the eye. Another kind, called periscopic spectacles, has been contrived in order to allow considerable latitude of motion to the eyes without fatigue. The lenses employed in this case are either of a meniscus or concavo-convex form, the concave side being turned to the eye.

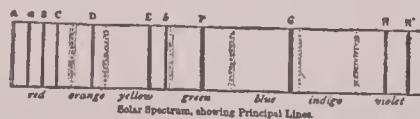
SPECTROSCOPE, the instrument employed in spectrum analysis. It usually consists of the following parts: 1st, a tube with a narrow slit at one end, and a convex lens at the other, from which parallel rays of light proceed when light is made to pass through the slit, the two forming together what is called the collimator. 2d. A prism of dense flint-glass on which the rays fall after emerging from the collimator. 3d. An observing telescope so placed that the rays traverse it after emerging from the prism. The accompanying figure gives



Arrangement of parts in spectroscope.

a ground plan of the arrangement; s is the slit, c the collimating lens, p the prism, o the object-glass of the telescope, and e the eye-piece. An image of the slit will be formed at f by rays of given refrangibility, others between f and v by rays of greater refrangibility, and others between f and r by rays of less refrangibility, thus giving a complete spectrum.

SPECTRUM, the oblong figure or stripe formed on a wall or screen by a beam of light, as of the sun, received through a narrow slit and passed through a prism, being thus decomposed or separated into its constituent rays. (See Light.) This stripe is colored throughout its length, the colors shading insensibly into one another from red at the one end, through orange, yellow, green, blue, indigo, to violet at the other. These colors are due to the different constituents of which solar light is made up, and the stripe seen is formed by an indefinite number of images of the slit ranged in order and partially overlap-



ping. The analysis of decomposition of the beam is due to the different refrangibilities of the component rays, the violet being the most refrangible and the red the least. Besides the colored rays, the spectrum contains thermal or heating rays, and chemical or actinic rays which are not visible to the eye. The heating effect of the solar spectrum increases in going from the violet to the red, and still continues to increase for a certain distance beyond the visible spectrum at the red end, while the chemical action is very faint in the red, strong in the blue and violet, and sensi-

ble to a considerable distance beyond the violet end. The actinic rays beyond the violet may be rendered visible by throwing them upon a surface treated with some fluorescent substance. A pure spectrum of solar light is crossed at right angles by numerous dark lines, called Fraunhofer's lines, each dark line being invariable in position. The figure shows the positions of the most conspicuous of these fixed lines, and the letters above them are the names by which they are known, being those assigned to them by the discoverer Fraunhofer. For the proper understanding of the import of these lines, five principles require to be kept in view. First, an incandescent solid or liquid body gives out a continuous spectrum. Second, an incandescent gaseous body gives out a discontinuous spectrum, consisting of bright lines. Third, each element when in the state of an incandescent gas gives out lines peculiar to itself. Fourth, if the light of an incandescent solid or liquid passes through a gaseous body, certain of its rays are absorbed, and black lines in the spectrum indicate the nature of the substance which absorbed the ray. Fifth, each element, when gaseous and incandescent, emits bright rays identical in color and position on the spectrum with those which it absorbs from light transmitted through it. The spectrum of sodium, for instance, shows two bright lines which correspond in position with the double black line at d (the sodium line) shown in figure. Now, applying these principles to the solar spectrum, we find, from the nature and position of the rays absorbed, that its light passes through hydrogen, potassium, sodium, calcium, barium, magnesium, zinc, iron, chromium, cobalt, nickel, copper, and manganese, all in a state of gas, and constituting part of the solar envelope, whence we conclude that these bodies are present in the substance of the sun itself, from which they have been volatilized by heat. The moon and planets have spectra like that of the sun, because they shine by its reflected light, while, on the other hand, each fixed star has a spectrum peculiar to itself. It has been already said that the incandescent vapor of each elementary substance has a characteristic spectrum, consisting of fixed lines, which never changes. This furnishes the chemist with a test of an exquisitely delicate nature for the detection of the presence of very minute quantities of elementary bodies. Thus, by heating any substance till it becomes gaseous and incandescent and then taking its spectrum, he is able by the lines to read off, as it were, from the spectrum, the various elements present in the vapor. Several new elements, as rubidium, cesium, indium, and thallium, have thus been detected. See Spectroscopy.

SPECTRUM ANALYSIS. See Spectrum.

SPECULUM, in optics and astronomy, a reflecting surface, such as is used in reflecting telescopes, usually made of an alloy of copper and tin, but frequently now of glass. Those of glass are covered with a film of silver on the side turned toward the object, and must not be confounded with mirrors, which are

coated with tin-amalgam on the posterior side. In surgery the name is given to an instrument used for dilating any passage, as the ear, or parts about the uterus, with a reflecting body at the end, upon which a light being thrown the condition of the parts is shown.

SPEECH, spoken language; uttered sounds intended to convey meaning, and produced by the organs of voice, namely, the larynx, and the mouth and its parts, including the tongue and teeth. In speech two great classes of sounds are produced, these being usually known as vowels and consonants. Vowels are pronounced by sounds coming primarily from the larynx and passing with comparative freedom through the mouth cavity, though modified in certain ways; while consonants are formed by sounds caused by the greater or less interruption of the current of air from the larynx in the mouth. Vowels can be uttered alone and independently of consonants, and their sounds can be prolonged at will; consonants have no importance in speech as apart from vowels, and are named consonants from being used along with vowels. Both vowel and consonant sounds are very numerous if we investigate the different languages of the world, but any one language only has a fraction of those that may be used. A single sound may convey an idea of itself and thus form a word, or several may be combined to form a word, and if the word is uttered by several distinct successive changes in position of the vocal organs it is a word of so many syllables. Words, again, are combined to form sentences or complete statements, and the aggregate of words used by any people or community in mutual intercourse forms its language.

SPENCER, Herbert, English philosopher, born at Derby 1820. In 1848 he became sub-editor of the *Economist*; published *Social Statics*, and *Principles of Psychology*. About the year 1859 he projected his *Scheme of Philosophy*, based on the principle of evolution in its relation to life, mind, society, and morals. This large scheme has been completely expounded in the following works: *First Principles*, one vol.; *Principles of Biology*, two vols.; *Principles of Psychology*, two vols.; *Principles of Sociology*, three vols.; and *Principles of Ethics*, two vols. Portions of this great work are known under separate titles, as *Data of Ethics*, *Ceremonial Institutions*, *Political Institutions*, *Ecclesiastical Institutions*, etc. His other works include *Education*, *Essays*, *Scientific*, *Political*, and *Speculative*; *Classification of the Sciences*, *The Study of Sociology*, *Man versus the State*, *The Factors of Organic Evolution*. He published also an elaborate *Descriptive Sociology* compiled by other writers, but classified and arranged by himself. He died in 1903. Spencer's works have been translated into various languages.

SPENSER, Edmund, English poet, was born in London about 1553. In 1859 he was engaged in the composition of the *Faerie Queene*, of which he had written the first three books. These were published in 1590, with a dedication to Queen Elizabeth. In 1595 he published

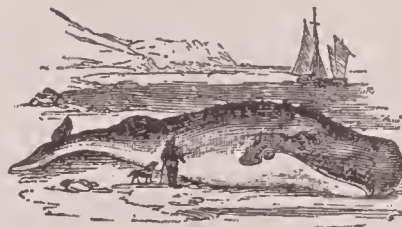
various volumes such as *Colin Clout's Come Home Again*, and *Astrophel and The Mourning Muse of Thestylis*; his sonnets and *Epithalamium* in one volume; the fourth, fifth, and sixth books of the *Faerie Queene*, together with a new edition of the first three books. As a poet, although his minor works contain many beauties, Spenser will be judged chiefly from the *Faerie Queene*. He died in 1599.

SPERMACE'TI, a fatty material obtained chiefly from cavities in the skull of the sperm whale. During the life of the animal the spermaceti is in a fluid state, forming part of the oily liquid which is found when the head of the whale is opened. On exposure to the air the spermaceti concretes, and deposits from the oil. Some of the larger whales have been known to yield twenty-four barrels of spermaceti, and from seventy to a hundred barrels of oil. After being purified the spermaceti concretes into a white, crystallized, brittle, semitransparent unctuous substance nearly inodorous and insipid. It is bland and demulcent, with considerable nutritive qualities when taken internally. It is chiefly employed externally as an ingredient in ointments and cerates. It is also largely used to form candles.

SPERMATIZO'A, the microscopic animalcule-like bodies developed in the semen of animals, each consisting of a body and a vibratile filamentary tail exhibiting active movements. Spermatozoa are essential to impregnation.

SPERM OIL, the oil of the spermaceti whale, which is separated from the spermaceti and the blubber. This kind of oil is much purer than train oil, and burns away without leaving any charcoal on the wicks of lamps. In composition it differs but slightly from common whale oil.

SPERM WHALE, or **CACHALOT**, a species of cetacea belonging to the section of the whale order denominated "toothed" whales, generally met with in the Pacific, but occasionally also on the



Sperm whale.

coast of Greenland. The large blunt head in an old male is sometimes 30 feet long, and forms about a third of the total length of the body; while the "blow-holes" or S-shaped nostrils are situated in the front part of the head. The weight of an adult animal is estimated at about 200 tons, and in a male 66 feet long the flipper measured 5 feet 3 inches, and the two-lobed tail-fin had a breadth of nearly 20 feet. The top of the back is continued almost in a straight line from the upper part of the head; the belly is enormous, but the body thins off toward the wide tail. The color is a blackish-gray, which may exhibit greenish or bluish hues on the upper parts. The

teeth of the lower jaw average each about 3 inches in length. This whale is of considerable commercial value. See *Spermaceti*.

SPHE'NOID BONE. See *Skull*.

SPHERE, in geometry, a solid body contained under a single surface, which in every part is equally distant from a point called the center. It may be conceived to be generated by the revolution of a semicircle about its diameter, which remains fixed, and which is hence called the axis of the sphere. A section of a sphere made by a plane passing through its center is called a great circle of the sphere; and when the cutting plane does not pass through the center the section is called a small circle of the sphere. A sphere is two-thirds of its circumscribing cylinder. Spheres are to one another as the cubes of their diameters. The surface of a sphere is equal to four times the area of one of its great circles, and the solidity is found by multiplying the cube of the diameter by .5236 or $\frac{8}{15}$ of .7854; or by multiplying the area of a great circle by $\frac{2}{3}$ of the diameter.

SPHE'ROGRAPH, a nautical instrument consisting of a stereographic projection of the sphere upon a disc of pasteboard, in which the meridians and parallels of latitude are laid down to single degrees. By the aid of this projection, and a ruler and index, the angular position of a ship at any place, and the distance sailed, may be readily and accurately determined on the principle of great circle sailing.

SPHINX, a fabulous monster which figures both in the Grecian and Egyptian mythologies. The sphinx of the Greeks is represented with a body like that of a lion, with wings, and with the breasts and upper parts of a woman. Hêra, says the fable, provoked with the Thebans, sent the sphinx to punish them. The sphinx proposed a riddle and devoured anyone who undertook but was unable to interpret its meaning. In this enigma the question proposed was, What animal walked on four legs in the morning, two at noon, and three in the evening. This was at last explained by Œdipus, who said that man walked on his hands and feet when young, or in the morning of life; at the noon of life he walked erect; and in the evening of his days he supported himself upon a stick. Whereupon her riddle being read, the sphinx de-



Egyptian sphinx, from the Louvre museum.

stroyed herself. The sphinx was used by the Greeks for artistic and decorative purposes, and seems to have been in some sense symbolic. The Egyptian sphinx had a human head (male or fe-

male) on the body of a lion (not winged), and was always in a recumbent posture, with the fore-paws stretched forward, and a head-dress resembling an old-fashioned wig. The features are like those of the ancient Egyptians found in the ancient ruins. The largest sphinx, that near the group of pyramids at Gizeh, is about 150 feet long and 63 feet high; the body is monolithic, but the paws, which are thrown out 50 feet in front, are constructed of masonry. There were also sphinx figures in Egypt with rams' heads and hawks' heads. The Egyptian sphinx was probably a purely symbolic figure, having no historical connection with the Greek fable, and the Greeks may have applied the term to the Egyptian statues merely on account of an accidental external resemblance to their own figures of the sphinx.

SPHINX MOTH, a species of moth belonging to the family Sphingidæ, and deriving its popular name from a supposed resemblance which its caterpillars present when they raise the fore part of their bodies to the "sphinx" of Egyptian celebrity. The sphinx moth is found very sparingly throughout England.

SPICES, the name given to all those vegetable substances, having an aromatic odor and a hot and pungent flavor, and used for seasoning food; such as cinnamon, cassia, mace, nutmeg, allspice, pepper, cloves, ginger, vanilla.

SPIDER, the common name of insect-like animals. The head and chest are united to form one segment known as a cephalothorax; no wings are developed, and breathing is effected by means of pulmonary or lung sacs. For the most part they are oviparous. The abdomen is furnished with from four to six cylindrical or conical mammillæ or processes, with fleshy extremities, which are perforated with numberless small orifices for the passage of silky filaments of extreme tenuity, with which they form webs, and which proceed from internal reservoirs. The spider's web is usually intended to entangle their prey (chiefly flies), but spiders also spin webs to make their abodes, and for other purposes. The legs number four pairs, and no antennæ are developed. Their mandibles are terminated by a movable hook, flexed inferiorly, underneath which, and near its extremity, is a little opening that allows a passage to a venomous fluid contained in a gland of the preceding joint. After wounding their prey with their hooked mandibles they inject this poison into the wound, which suddenly destroys the victim.

SPIDER CRAB, the name given to crabs from the rough general resemblance their bodies and long legs possess to those of spiders. The common or thornback spider crab, is a familiar species, and is very commonly taken in the crab pots of fishermen. The four-horned spider crab has a triangular body, possessing four horn-like processes in front, the two central ones forming the rostrum or beak.

SPIDER FLY, a dipterous insect of the family Pupipara. There are many species of these found parasitic on birds and quadrupeds.

SPIDER MONKEY, a general name applied to many species of platyrrhine or New World monkeys, but more especially to the members of the genus which are distinguished by the great relative length, slenderness, and flexibility of their limbs, and by the prehensile power of their tails. A familiar species is the



Spider monkey.

chameck, which occurs abundantly in Brazil. The body is about 20 inches, the tail 2 feet long, and the color is a general black. The coaita, another typical species, has an average length of 12 inches; the tail measures over 2 feet long, and the fur is of a dark, glossy, black hue.

SPIKENARD, a highly aromatic herbaceous plant growing in the East Indies. The root has a strong smell and a sharp bitterish taste. This is the true spikenard of the ancients, and it has enjoyed celebrity from the earliest period on



Spikenard.

account of the valuable extract or perfume obtained from its roots, which was used in the ancient baths and at feasts. It is highly esteemed in the East as a perfume, and is used to scent oil and unguents.

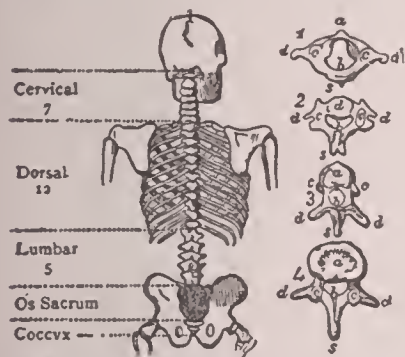
SPIKING, the operation of driving a nail or spike into the touchhole of a cannon so as to make it unserviceable. When the spiking was intended to be only temporary a spring spike was used, which was afterward released by the stroke of a hammer. In other cases a new touchhole required to be drilled.

SPIN'AGE, **SPIN'ACH**, a genus of plants. There is only one species, well-known on account of its use in the kitchen. It is eaten sometimes in salads, but more frequently cooked in various ways. It is wholesome and agreeable, but contains little nutriment.

SPINAL CORD, the name given in anatomy to the great cord or rod of nervous matter which is inclosed within the backbone or spine of vertebrates. The spinal cord in man, which is from 15 to 18 inches long, has direct connection with the brain by means of the medulla oblongata, and passes down the back until it terminates in a fine thread at the level of the first lumbar vertebra. Lodged in the bony vertebræ it varies in thickness throughout, and like the brain is invested by membranes called respectively pia mater and dura mater. Situated between these two are the delicate layers of the arachnoid membrane, inclosing a space which contains the cerebro-spinal fluid. Besides these protective coverings there is also a packing of fatty tissue which further tends to diminish all shocks and jars. The spinal nerves, to the number of thirty-one on each side, pass out from the cord at regular intervals, pierce the dura mater, escape from the backbone, and ramify thence through the soft parts of the body. Eight pairs pass off in the region of the neck called the cervical nerves, twelve pairs are dorsal, five are lumbar, and five sacral, while the last pair comes off behind the coccyx. In its structure the spinal chord consists of gray and white matter. The gray matter, which is characterized by large cells, is gathered in the center into two crescent shaped masses connected at the central part of the cord. The white matter, consisting mainly of fibres, is outside of and surrounds these gray crescents. In its functions the spinal cord forms a tract along which sensory impressions may pass to the brain, and along which motor impulses may travel to the muscles. It is besides a great reflex center. See Brain, Nerve, and Spine.

SPINE, the term applied to the backbone of a vertebrate animal, and so called from the thorn-like processes of the vertebræ. The human vertebral column is composed, in the child, of thirty-three separate pieces, but in the adult the number is only twenty-six, several pieces having become blended together. These separate bones are arranged one on the top of the other, with a layer of gristle between each which helps to unite them, while this union is completed by partially movable joints and strong fibrous ligaments. The first seven vertebræ, which are called cervical, occupy the region of the neck; twelve form the supports from which spring the ribs, and constitute the main portion of the back, being accordingly called dorsal; five in "the small of the back" are denominated lumbar; five pieces follow which, in the adult, unite to form the sacrum; and four which unite to form the coccyx. The vertebral column so arranged presents two forward curves, the first in the neck; the second at the lower part of the back; and two corresponding backward curves. The vertebræ differ in form according as they belong to the cervical, dorsal, or lumbar region, but they have all certain characteristics in common. Each possesses what is called a body, an arch which incloses a ring, and various projections and notches by means of which the bones are articulated.

When the vertebræ are in position the rings are all situated one above the other, and so form a cavity or canal in which lies the protected spinal cord (which see). The disease to which this bony structure is most liable is called angular curvature of the spine. Beginning with inflammation it goes on to ulceration (caries), until one or more of the vertebræ becomes soft and breaks down. The result of this is that the vertebræ are crushed together, the backbone bent, and a projection or hump gradually formed behind. The modern method of treatment is to apply to the patient's body, from the hips to the arm-pits, a continuous bandage of plaster of Paris, which affords to the back a close-fitting support. Lateral curvature of the spine, unlike the former



1. Atlas, or vertebra supporting the head. 2. Cervical vertebra. 3. Dorsal vertebra. 4. Lumbar vertebra. a. Body. b. Ring. c. Oblique or articular process. d. Transverse process. e. Spinous process.

is not so much due to disease of the column as to a relaxed condition of the body. It is most liable to attack young rapidly-growing persons between the ages of ten and fifteen. Treatment by plaster-of-Paris bandage may be necessary; but strengthening food, regular, moderate exercise, and cold bathing may prove sufficient to effect a cure.

SPINE, in botany, a sharp process from the woody part of a plant. It differs from a prickle, which proceeds from the bark. A spine sometimes terminates a branch, and sometimes is axillary, growing at an angle formed by the branch or leaf with the stem. The wild apple and pear are armed with spines; the rose, bramble, gooseberry, etc., are armed with prickles.

SPIN'ET, an old stringed instrument with a keyboard for the fingers, somewhat similar to the harpsichord but smaller in size, one of the precursors of the piano. The strings, which were placed at an angle with the keys, were sounded by means of crow-quill plectra attached.

SPINNING is the art of twisting a thread from wool, flax, cotton, or other such material. From remote times this process was accomplished by means of a distaff round which the wool or other fiber to be spun was coiled, and a spindle or round stick tapering at each end and with a notch for fixing the yarn or thread at the upper end as the spinning went on. The spindle was twirled round, for the purpose of twisting the thread, generally by a movement against the

right leg, and while the left hand of the spinner guided and supplied the fiber, the right hand fashioned it into a thread between finger and thumb. The earliest improvement on this method was to fix the spindle horizontally in a frame and cause it to revolve rapidly by means of a band passed round a large wheel. At a later period a treadle motion was added, and the spinner's hands were left free (see Spinning-wheel); while a further improvement was effected by the introduction of a double spindle-wheel, with twisting arms on the spindles. This was the spinning implement which obtained until the invention about 1767, of the spinning-jenny.

SPINNING JENNY, the name given to the first spinning-machine by means of which a number of threads could be spun at once. It was invented about 1767 by James Hargreaves, a Lancashire weaver, and consisted of a number of spindles turned by a common wheel or cylinder worked by hand.

SPINNING WHEEL, a machine for spinning wool, cotton, or flax into threads by the hand. It consists of a wheel, band, and spindle, has a distaff attached, and is driven by foot or by hand, usually the former, a treadle being employed. Before the introduction of machinery for spinning there were two kinds of spinning wheels in common use, the large wheel for spinning wool and cotton, and the small or Saxon wheel for spinning flax.

SPINO'ZA, Baruch, or as he afterward called himself, Benedict de Spinoza was born in 1632, died in 1677. He was trained in Talmudic and other Hebrew lore, acquired a knowledge of Latin, came under the influence of the new philosophic teaching of Descartes; ceased to attend the synagogue, and was expelled from the Israelitish community; fled from Amsterdam to the suburbs to escape the enmity of the fanatical Jews; removed from thence, after five years' seclusion, to Rynsburg, where he lived until 1663; subsequently went to Voorburg; and ultimately (1671) settled in The Hague, where he died. He published anonymously in 1670 under the title of *Tractatus Theologico-Politicus*

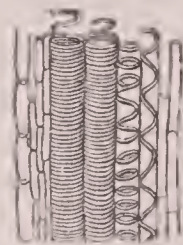


Benedict de Spinoza.

and, because it put forth a strong plea for liberty of speech in philosophy, it was placed on the Index by the Catholics, and condemned by the authorities

in Holland. Such, indeed, was the storm which this treatise occasioned that the author himself published nothing further. After his death all his unpublished writings were conveyed to Amsterdam, and there the *Opera Posthuma* was published (1677). In the *Ethics*, therein included, his system of philosophy was developed; each of its five books being dignified by a series of axioms and definitions after the method of Euclid in his geometry. In all there are twenty-seven definitions, twenty axioms, and eight postulates; and the central conception of the whole system is, that God who is the inherent cause of the universe, is one absolutely infinite substance, of which all the several parts which we recognize are but finite expressions; that man, being but a part of this greater whole, has neither a separate existence nor a self-determining will; but that he can, by means of knowledge and love, so far control his passions as to enter into the joy which springs from this idea of an all-embracing God.

SPIRAL VESSELS, in vegetable anatomy, fine transparent membranous tubes, with one or more spiral fibers coiled up in their interior. They are generally present among the other vessels of plants, and in trees are found chiefly in the medullary sheath surrounding the pith. The fiber may be single or double, or it may be composed of numerous threads. Their function is



Spiral vessels of Rhubarb, with cell tissue on each side—highly magnified.

supposed to be that of the conveyance of air. They are easily discovered on breaking asunder the leaves and stalks of many plants, when the fibers may be unrolled, and present themselves as delicate filaments like the threads of a cobweb.

SPIRIT, immaterial intelligence, intelligence conceived of as apart from any physical or corporeal embodiment, or an intelligent being so existing apart; also applied to the soul, to a disembodied soul, a specter, etc.

SPIRIT, Spirits. See Alcohol.

SPIRIT LEVEL, an instrument employed for determining a line or plane parallel to the horizon, and also the relative heights of ground at two or more stations. It consists of a tube of glass nearly filled with spirit of wine, and hermetically sealed at both ends, so that when held with its axis in a horizontal position the bubble of air which occupies the part not filled with the liquid rises to the upper surface and stands exactly in the middle of the tube. The tube is placed within a brass or wooden case, which is laid on the surface

to be tested, and the slightest deviation from the horizontal is indicated by the bubble rising toward the higher end of the tube.

SPIRITUALISM, is the term used in philosophy to indicate the opposite of materialism, but is now also specifically applied to the belief that communication can be held with departed spirits by means of rappings or noises, writings, visible manifestations, etc. The belief in such manifestations has long obtained, but in its limited and modern form spiritualism dates from the year 1848. In this year a Mr. and Mrs. Fox, who lived with their two daughters at Hydeville, New York, were disturbed by repeated and inexplicable rappings throughout the house. At length it was accidentally discovered by one of the daughters that the unscen "rapper" was so intelligent as to be able to reply to various pertinent questions, and so communicative as to declare that he was the spirit of a murdered pedlar. When this discovery was noised abroad a belief that intercourse could be obtained with the spirit-world became epidemic, and numerous "spirit-circles" were formed in various parts of America. The manifestations thus said to be got from the spirits were rappings, table-turnings, musical sounds, writings, the unseen raising of heavy bodies, etc. Part of the peculiarity of these phenomena was that they were always more or less associated with the medium, who was supposed to have an organization sensitively fitted to communicate with the spirit-world. In America the believers in spiritualism are very numerous and have many newspapers, magazines, and books to explain and enforce their belief. The investigations of the Psychical society, seem to show that there are forces connected with hypnotism and its kindred phenomena which may explain the occult occurrences of spiritualism on natural, though hitherto, little known laws. The literature on the subject is extensive.

SPIROM'ETER, a contrivance for determining the capacity of the human lungs. The instrument most commonly employed consists of an inverted chamber submerged in a water-bath. The breath is conducted by a flexible pipe and internal tube, so as to collect in the chamber, which rises in the water, and is fitted with an index which marks the cubic inches of air expired after a forced inspiration.

SPIR'ULA, a genus of cuttlefishes or cephalopods, comprising only three known species, so named from their very delicate shell being rolled into a spiral form. The shells are very numer-



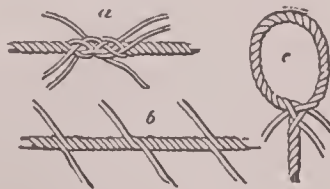
1, *Spirula australis*. 2, Its shell.

ous on the shores of New Zealand, but the animal forming them is extremely rare, being seldom found except in a fragmentary state.

SPITZBER'GEN, a group of three large and several small islands in the Arctic ocean. Very little is known of their interior, but the coasts have been repeatedly explored, and present immense glaciers and mountain chains, some of which exceed 4000 feet in height. The climate is intensely cold; and vegetation is confined to a few plants of rapid growth. For four months in winter the sun is below the horizon, and for an equal period in summer the sun is always above the horizon. The larger forms of animal life are foxes, bears, and reindeer, while sea fowl are numerous. The minerals are known to include marble and good coal.

SPLEEN, The, in man, is the chief of the ductless or blood glands, and its action is supposed to affect the quality of the blood. This gland, which in man is situated in the belly to the left side of the stomach, is an elongated, flattened structure about 5 inches in length, 3 inches broad, and 7 ounces in weight. Its supply of blood is received directly from the aorta by means of the splenic artery, and, after passing through the organ, is carried off by the splenic vein which joins the portal vein. It is composed of a fibrous tissue divided into an irregular net-work of spaces which contain the spleen pulp. This pulp consists of masses of round white corpuscles, some larger and some smaller, which are called the Malpighian bodies of the spleen. Through each one of these cellular masses there passes a branch from the splenic artery, and in this way the blood filters through the pulp as though it were a sponge, and is then collected by the veins. The function of the spleen is not clearly known, but it is supposed that the active cells of the pulp either remove old red cells from, or add new white cells to, the blood current in its passage through the organ. The ancients supposed the spleen to be the seat of melancholy, anger, or vexation, and of evil humors generally.

SPLICING, the union or joining together of two ropes or parts of a rope by a particular manner of interweaving part of the untwisted strands. The long splice occupies a great extent of rope, but by the three joinings being fixed at a distance from one another, the increase



Splices of ropes.
a, Short splice. b, Long splice. c, Eye splice.

of bulk is diminished, hence it is adapted to run through the sheave-hole of a block, etc. The short splice is used upon ropes not intended to run through blocks, and the eye splice forms a sort of eye or circle at the end of a rope.

SPLINT, in surgery, a thin piece of wood, or other substance, used to hold or confine a broken bone when set, or to maintain any part of the body in a fixed position. A plaster-of-Paris splint is

made by charging a bandage of muslin or other open material with plaster of Paris, and washing over each layer with water. The plaster hardens rapidly.

SPLINT BONE, one of the two small bones extending from the knee to the fetlock of a horse, behind the canon or shank bone.

SPOFFORD, Ainsworth Rand, American librarian, born at Gilmanton, N. H., in 1825. From 1864 to 1899 he was librarian in chief of the congressional library, and became known for exceptional knowledge of books. He edited with others a Library of Choice Literature (10 vols., 1881-88), and a Practical Manual of Parliamentary Rules (1884). He published The American Almanack and Treasury of Facts, Statistical, Financial, and Political, and a work on the collection and preservation of books and founding of libraries. He died in 1908.

SPOFFORD, Harriet Elizabeth (Prescott), an American novelist, born at Calais, Me., in 1835. She first attracted attention in 1859 by a story of Parisian life, In a Cellar, printed in the Atlantic Monthly. Some of her later books are New England Legends, Art Decoration Applied to Furniture, Marquis of Carabas, Poems, Scarlet Poppy and Other Stories, In Titian's Garden and Other Poems. Four Days of God, etc.

SPOKANE, (spō-kān'), the county seat of Spokane co., Wash., 450 miles east of Puget sound, on the Spokane river and on the Northern Pacific railway, the Great Northern railway, the Oregon Railroad and Navigation company, and several local branch lines. Fort Wright, a large United States army post, is situated on the river just outside the city. Spokane is the mining center of the Pacific northwest for gold, silver, copper, and lead. Pop. 42,761.

SPONGE, the name commonly given to the animals of the class Porifera, a class of organisms representing a distinct morphological type, intermediate between the Protozoa and the Cœlenterata. The typical members are composed of two elements, an internal supporting framework or skeleton, and a soft gelatinous investing substance called sarcode, or "flesh." The framework consists of horny, reticulated, elastic fibers, which interlace in every direction, strengthened by calcareous, or, more generally, by siliceous spicula. This framework is the sponge of commerce. The sponge flesh investing this framework is composed of an aggregation of organless, protoplasmic, and amœbiform bodies, some ciliated and others capable of emitting pseudopodia. A constant circulation of water goes on in the living sponge, and by this circulation the animal is nourished. Reproduction takes place both by gemmation and true ova. In common usage the term sponge is employed to designate the fibrous framework of sponges as sold in our shops. This framework is soft, light, and porous, easily imbibing fluids, and as readily giving them out again upon compression. Sponges are usually prepared before they come into the market, by being beaten and soaked in dilute muriatic acid, with a view to bleach them and dissolve any adherent portions of carbonate of lime.

SPONTANEITY, the doctrine that there is a tendency, for the various muscular movements called voluntary, to begin without reference to any purpose or end, being prompted simply by the discharge of power from the brain, and being entirely independent of the stimulus of sensations. The great activity of young animals, as puppies and kittens, after refreshment and repose, is a good example of spontaneity.

SPONTANEOUS COMBUSTION. See Combustion (Spontaneous).

SPONTANEOUS GENERATION. See Generation (Spontaneous).

SPOONBILL, the popular name of birds belonging to the heron family from the shape of the bill, which is somewhat like a spoon, being curiously widened out at the tip. They live in society in wooded marshes, generally not far from the mouths of rivers, and on the sea-shore. The color is pure white, the



White spoonbill.

breast being yellow, with a naked patch of skin on the throat; the legs are black, and the bill, which is about 8 inches in length, is black, and yellow at the tip.

SPORAD'IC, applied to a disease which occurs in single and scattered cases as distinct from epidemic and endemic, when many persons are affected.

SPORID'IUM, in botany, a name given to the spores of fungi and lichens when they are contained in asci or little sacs. Sporidia, like spores, may consist of one or more cells, and these may be



Sporidia.

covered with a distinctly organized cuticle, as in many truffles. In the figure a shows asci and sporidia of a species of *Peziza*, b sporidium.

SPRAIN, the violent straining or twisting of the ligaments and tendons which form the soft parts surrounding a joint. The ordinary consequence of a sprain is to produce some degree of swelling and inflammation in the injured part. The best treatment is to give the limb perfect rest, by means of splints or otherwise, and to foment the part for an hour or two with warm water. If the inflammation increases leeches should be applied. When this has passed

the joints should be gently rubbed with a liniment of soap and opium. The joint often remains weak and faint for a length of time, and too great caution cannot be observed in bringing it again into use.

SPRAT, a small fish of the herring family. At one time the sprat was thought to be the young of the herring, pilchard, or shad; but it can be easily distinguished from the young of either of these fishes by means of the sharply-notched edge of the abdomen, the ventral fins beginning beneath the first ray of the dorsal fin, and by the want of axillary scales to the ventral fins.

SPRING, one of the four seasons of the year. For the northern hemisphere the spring season commences when the sun enters Aries, or about the 21st of March, and ends at the time of the summer solstice, or about the 22d of June. In common language, spring is usually regarded as commencing with March and ending with May. In the southern hemisphere the astronomical spring begins September 23, and ends December 21.

SPRING, an outflow of water from the earth, or a stream of water at the place of its source. Springs have their origin in the water which falls upon the earth in the form of rain or snow, and sinks through porous soils till it arrives at a stratum impervious to water, where it forms subterranean reservoirs at various depths. When the pressure of the water which fills the channels through which it has descended is sufficient to overcome the resistance of the superincumbent mass of earth, the water breaks through the superficial strata and gushes forth in a spring; or it may find some natural channel or crevice by which to issue. In descending and rising through various mineral masses the water of springs often becomes impregnated with gaseous, saline, earthy, or metallic admixtures, as carbonic acid gas, sulphuretted hydrogen gas, nitrogen, carbonate of lime, silica, carbonate of iron, etc. When these substances are present in considerable quantity the springs become what are known as mineral springs. Warm and hot springs are common, especially in volcanic countries, where they are sometimes distinguished by violent ebullitions. (See Geysers.) Some springs run for a time and then stop altogether, and after a time run again, and again stop; these are called intermittent springs. Others do not cease to flow, but only discharge a much smaller quantity of water for a certain time, and then give out a greater quantity; these are called variable springs.

SPRING, an elastic body, the elasticity of which is made practically available. Springs are made of various materials, as a strip or wire of steel coiled spirally, a steel rod or plate, strips of steel, suitably joined together, a mass or strip of india-rubber, etc., which, when bent or forced from its natural state, has the power of recovering it again in virtue of its elasticity. Springs are used for various purposes—diminishing concussion, as in carriages; for motive power, acting through the tendency of a metallic coil to unwind itself, as in clocks and watches or to communicate motion by sudden

release from a state of tension, as the spring of a gun-lock, etc.; others are employed to measure weight and other force, as in the spring-balance, as regulators to control the movement of wheel-works, etc.

SPRING BALANCE, a contrivance for determining the weight of any article by observing the amount of deflection or compression which it produces upon a spiral steel spring properly adjusted and fitted with an index working against a graduated scale. See Balance.

SPRINGBOK, Springboc, a species of antelope nearly allied to the gazelle, found in vast herds in South Africa, and used as food by the colonists. It is a very beautiful animal, of graceful form and fine colors—fulvous brown on the upper parts, pure white beneath, with a broad band of deep vinous red where



Springbok.

the colors meet on the flanks. It is larger than the roebuck, and its neck and limbs much longer and more delicate. The horns curve in a lyre-shape, and are small in the female. It receives its name from its singular habit of leaping perpendicularly to the height of several feet.

SPRINGFIELD, a city, capital of Hampden co., Massachusetts, situated on the left bank of the Connecticut, here navigable, about 98 miles west by south from Boston. It contains many fine churches and other buildings, and the streets are wide and planted with shade trees. Here is the United States armory, in which large numbers of rifles are manufactured, and there is also a government arsenal capable of storing 300,000 stand of arms. The water-power furnished by Mill river has developed various industries, such as iron-works, machine-shops, paper, cotton, and other mills, and railway-car manufacturing. Pop. 1909, estimated at 82,000.

SPRINGFIELD, the capital of Illinois, and seat of justice for Sangamon co., 96 miles n.e. of St. Louis. Its public edifices include a state-house or capitol, a large and imposing building in the classic style with a dome 320 feet high; a courthouse and post-office building, and the national monument to Abraham Lincoln, who is buried here, an obelisk nearly 100 feet high. Among the manufacturing establishments are woolen

mills, rolling-mills, foundries, and there are coal-mines in the neighborhood. Pop. 1909, estimated at 68,000.



State-house, Springfield, Ill.

SPRINGFIELD, a city, capital of Clarke co., Ohio, on the east fork of Mad river, 43 miles west by south of Columbus. It has a courthouse and other public buildings, numerous mills and manufacturing establishments (especially for agricultural implements and machines, including reapers and mowers), and an extensive trade. Pop. 1909, estimated at 60,000.

SPRINGFIELD, the capital of Greene co., Missouri, on the summit of the Ozark mountains, in the midst of rich lead and zinc mines. Pop. 25,217.

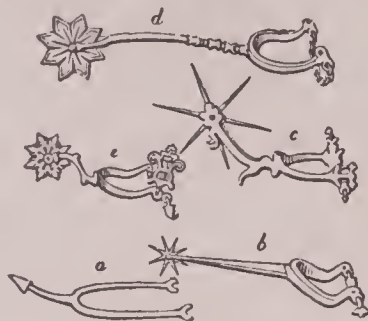
SPRINGTIDE, the tide which happens at or soon after the new and full moon, which rises higher than common tides. At these times the sun and moon are in a straight line with the earth, and their combined influence in raising the waters of the ocean is the greatest, consequently the tides thus produced are the highest. See Tide.

SPRIT, a small boom, pole, or spar which crosses the sail of a boat diagonally from the mast to the upper aft-most corner, which it is used to extend and elevate. Such a sail is called a sprit sail. The same name was formerly given to a sail attached to a yard under the bowsprit of large vessels.

SPRUCE, the name given to several species of trees. The Norway spruce-fir yields the valuable timber known under the name of white or Christiania deal. It is a native of great part of Northern Europe and is a noble tree of conical habit of growth, reaching sometimes the height of 150 feet. The white spruce and the black spruce-fir are natives of North America. The latter attains the height of 70 or 80 feet, with a diameter of from 15 to 20 inches. Its timber is of great value on account of its strength, lightness, and elasticity, and is often employed for the yards of ships and the sides of ladders. From the young shoots is extracted the essence of spruce, a decoction used in making spruce beer. The hemlock spruce-fir is a noble species, rising to the height of 70 or 80 feet, and measuring from 2 to 3 feet in diameter. It grows abundantly over great part of Canada and part of the United States. The wood is employed for laths, fences, coarse indoor work, etc. The bark is exceedingly valuable for tanning. Douglas' spruce or fir, of Northwestern

America, reaches a height of 100 to 180 feet in its native forests.

SPUR, an instrument having a rowel or small wheel with sharp points, worn on a horseman's heel, and used for goading the horse. In early times it took the simple form of a sharp-pointed goad, the rowel first appearing in the end of the



Ancient spurs.

a, Frankish spur (10th cent.). b, Brass spur (time of Henry IV.). c, Long-spiked rowel spur (time of Edward IV.). d, Long-necked brass spur (time of Henry VII.). e, Steel spur (time of Henry VIII.).

13th century. Spurs were especially the badge of knighthood. Hence, to win one's spurs, was to become a knight, and the phrase is now used to indicate the achievements of distinction in one's profession.

SPURGEON (spur'jn), Rev. Charles Haddon, was born at Kelvedon, Essex, in 1834; accepted the pastorate of a small Baptist congregation at Water-beach while he was only eighteen; removed from thence in 1853 to a chapel in New Park Street, Southwark, which, becoming too small for his audience, required him to engage the Surrey music hall, and ultimately to build, in 1861, the well-known Metropolitan tabernacle. He died in 1892. He wrote numerous volumes, of which the best-known are *The Saint and his Savior*, *John Ploughman's Talk*, *The Metropolitan Tabernacle*, *Farm Sermons*, *Storm Signals*, and he edited the monthly magazine *Sword and Trowel*.

SPY, a secret emissary sent into the enemy's camp or territory to inspect their works, ascertain their strength and their intentions, to watch their movements, and report thereon to the proper officer. By the laws of war among all civilized nations a spy is subjected to capital punishment.

SQUAD, a small body of troops assembled for drill, inspection, or other purposes. The awkward squad is composed of those recruits who have not received sufficient training to take part in regimental drill.

SQUADRON, the principal division of a regiment of cavalry. The actual strength of a squadron varies with that of the component troops, but it ranges from 120 to 200 sabers. A squadron is divided into two troops, each of which is commanded by its captain. Each regiment of cavalry consists of three or four squadrons. The term is applied also to a division of a fleet, being a detachment of ships of war employed on a particular service or station, and under the command of a commodore or junior flag-officer.

SQUARE, in geometry, a quadrilateral

figure, both equilateral and equiangular, or, in other words, a figure with four equal sides and equal angles. In measuring superficial areas it is only necessary to multiply one side by itself to have the area of the square, because each of the sides may be considered as the basis or as the perpendicular height. Thus a square the sides of which measure 4 feet is equal to 16 square feet, that is, sixteen squares each 1 foot high and 1 foot long. To square a figure (for example a polygon) is to reduce the surface to a square of equivalent area by mathematical means. It has often been attempted to square the circle, but this cannot be done. In arithmetic and algebra the square of a number is the number or quantity produced by multiplying a number or quantity by itself. Thus 64 is the square of 8, for $8 \times 8 = 64$.

SQUARE, in military tactics, a body of infantry formed into a rectangular figure with several ranks or rows of men facing on each side, with officers, colors, etc., in the center. The front rank kneels, the second and third stoop, and the remaining ranks (generally two) stand. This formation is usually employed to resist a cavalry charge. Hollow squares are frequently formed with the faces fronting inwards when orders and instructions, etc., are to be read, and the like.

SQUARE-RIGGED, a term applied to a vessel carrying chiefly square sails, that is, whose principal sails are extended by yards suspended by the middle, and not by stays, gaffs, booms, and lateen yards. Thus a ship and a brig are square-rigged vessels.

SQUARE ROOT. See Root.

SQUARE-SAIL. See Square-rigged.

SQUASH, a plant cultivated in America as an article of food. The name is also given to other species. See Gourd.

SQUASH-BUG, a name given in North America to several hemipterous insects, best known as destroyers of squash, pumpkin, and other plants.

SQUATTER SOVEREIGNTY. See Popular Sovereignty.

SQUATTER, a person that settles on a piece of land, particularly on public land, without a title. In Australia the term is also applied to one who occupies an unsettled tract of land as a sheep-farm under lease from government at a nominal rent.

SQUID, a popular name of certain cuttlefishes belonging to the dibranchiate group of the class Cephalopoda, and included in several genera, of which the most familiar is that of the calamaries. See Calamary.



Squill.

SQUILL, a plant nearly allied to the hyacinths, onions, etc. The term squill

is more particularly applied to the officinal squill or sea-onion, which has a large acrid bulbous root like an onion. It is a native of the sandy shores of the Mediterranean. The bulb has been known as a medicine from the earliest ages, and is still used as a diuretic and expectorant. In large doses it causes vomiting, purging, and may even prove fatally poisonous.

SQUINCH, Sconce, in architecture, a small pendentive arch (or several com-



Squinch, Maxstoke Priory, Warwickshire.

bined) formed across an angle, as in a square tower to support the side of a superimposed octagon.

SQUINT, in architecture, an oblique opening passing through the wall of many old churches, usually constructed for the purpose of enabling a person in the transepts or aisles to see the elevation of the host at the high altar. Generally they are not above a yard high and 2 feet wide, but sometimes they form narrow arches 10 or 12 feet in height, as at Minster-Lovell, Oxfordshire. The name hagioscope is sometimes applied to them.

SQUINTING, or **STRABISMUS**, a defect of the eyes owing to which they cannot both be brought to bear upon the same object at once. It is usually due to one of the lateral muscles of the eye having a longer pull than the other. It may also arise from paralysis of one muscle caused by a blow. There are several kinds of squint, the two chief being inward or convergent and outward or divergent, the axes of the eyes in the one case tending to meet, in the other to separate. For persons so affected, and especially children, it is well not to look too long at small objects or read in ill-lighted rooms, and glasses to correct the sight should be obtained. It is also a good thing to have the sound eye (when there is but one squinting eye) bandaged up for a short time each day. When these measures fail the muscle can be lengthened by means of a simple surgical operation.

SQUIRREL, a small rodent mammal of the family Sciuridæ. This family comprehends three groups—the true squirrels, the ground-squirrels, and the flying-squirrels. The true squirrels are distinguished by their strongly compressed inferior incisors and by their long bushy tail. They have four toes before and five behind. The thumb of the fore-foot is sometimes marked by a tubercle. They have in all four grinders variously tuberculated, and a very small additional one above in front, which very soon falls. In color they are usually

of a rich ruddy brown on the upper parts, merging into reddish or grayish-white on the under parts of the body, but the fur varies with the season and climate so that in winter it may be of a gray appearance. The head is large, and the eyes projecting and lively. Several species are enumerated, as the common squirrel, which inhabits Europe and the north of Asia; while the cat squirrel, gray squirrel, black squirrel, red squirrel, and the great-tailed squirrel are American species. The common squirrel and several other species are remarkably nimble, running up trees and leaping from branch to branch with surprising agility. They subsist on nuts, acorns, seeds, etc., of which they lay up a store for winter, some of them in



Squirrel.

hollow trees, others in the earth. Their nest, which consists of woody fiber, leaves, and moss, is usually situated in a fork of a tree, and the young, of which there are three or four, are born in June. When engaged in eating they sit on their haunches with their tail thrown upward on the back, grasp the eatables with their fore-paws, and gnaw with their powerful teeth. The fur of some of the American species is an article of commerce. See also Ground Squirrel and Flying Squirrel.

SQUIRREL MONKEY, a monkey inhabiting Brazil, resembling in general appearance and size the familiar squirrel. A well-known species is colored grayish olive, and under surface being gray, the ears white, and the tail tipped with black.

SRINAGAR, a city, the capital of the state of Cashmere, in the Western Himalayas, situated in the valley of Cashmere, on both banks of the Jehlum. Pop. 122,536.

STABAT MATER, the first words, and hence the name, of a mediæval hymn still sung in the ecclesiastical service of the Roman Catholic church during Holy Week, and at the festival of the Seven Dolours of the Virgin Mary.

STACCA'TO, in music, disconnected; separated; a direction to perform the notes of a passage in a crisp, detached, distinct, or pointed manner. It is generally indicated by dots or dashes placed over the notes, the dash implying the strongest or most marked degree of staccato or crispness. A certain amount of time is subtracted from the nominal value of any note performed staccato.

STADIUM, a Greek measure of 125 paces, or 625 Roman feet, equal to 606 feet 9 inches English; consequently the Greek stadium was somewhat less than our furlong. It was the principal Greek measure of length. This term was also applied to the course for foot-races at Olympia in Greece, which was exactly a stadium in length. The name was also given to all other places throughout Greece wherever games were celebrated.

STAEL-HOLSTEIN, Anne Louise Germaine Necker, Baroness de, the only child of Necker, Swiss banker and minister of finance to Louis XVI., was born in 1766, died 1817. In 1786 she published *Sophia*, a comedy, and two tragedies entitled *Lady Jane Grey*, and *Montmorency*; while in this same year she married Baron de Staël-Holstein, Swedish ambassador at the French court. In 1788 she printed her *Lettres sur les Ecrits et le Caractère de J. J. Rousseau*. During the Reign of Terror she fled to Coppet (1792), her father's estate in Switzerland, after vainly endeavoring to save her friends and the royal family. In 1793 she sought refuge in England, where she published *Reflections on the Trial of the Queen*, and *Reflections on the Peace*. During the Directory Madame de Staël-Holstein returned to Paris, where she again became an influence in politics, and published her essay on the *Passions*. Subsequently she was banished by Napoleon on account of her bold advocacy of liberal views, and her wanderings through Europe are described in her *Ten Years of Exile*. Her other writings comprise *De la Littérature Considérée dans ses Rapports avec les Institutions Sociales*; *Delphine* (1802); *Corinne ou l'Italie* (1807), a novel in which Italian life and scenery are exhibited with thorough knowledge, her most popular work.

STAFF, a body of officers whose duties refer to an army or regiment as a whole, and who are not attached to particular subdivisions. In the United States this body is divided into the military staff and the administrative staff. The former is charged with the more purely military duties, and comprises the chiefs of staff, the adjutants-general, the inspectors-general, the chief of artillery, the chief of cavalry, the chief of engineers, the chief signal officer, the provost-marshal-general, and the aides-de-camp. The administrative staff is charged with the service of administration and supply, and comprises the judge advocate, the commissary of musters, the chief ordnance officers, the chief quarter-masters, the chief commissaries, the chief paymasters, and the medical directors and their respective assistants.

STAFF, in music, the five parallel lines and their intermediate spaces, on which the notes, sharps, flats, and other musical characters are placed. See Music.

STAFFORD, a municipal and parliamentary borough of England, the county town of Staffordshire, situated on the river Sow, about 130 miles n. w. of London. The principal industries are the making of boots and shoes, brewing, and tanning. Since 1885 Stafford sends one member to parliament, instead of two, as formerly. Pop. 20,894.—The county is one of the central counties of England,

and is bounded by Cheshire, Derbyshire, Warwickshire, Worcestershire, and Shropshire; greatest length from north to south, 50 miles; central breadth, 35 miles; area, 748,433 acres, or 1170 square miles. The chief industries are coal-mining, iron-ore mining, smelting, and manufacturing, and North Staffordshire is the chief center in the kingdom for the various earthenware manufactures. Pop. 1,234,382.

STAG, or **RED DEER**, a large and handsome deer which is a native of Europe and Northern Asia, and in Britain is now found wild only in the Highlands of Scotland. In summer the back and flanks of the stag are of a reddish-brown color, while these parts in winter are gray-brown. A full-sized male stag with antlers well developed stands about 4 feet high at the shoulder, and has horns 3 feet in length, while the female is smaller and has no horns. They feed on grass, buds and young shoots of trees, and in winter they roam in herds. The pairing season occurs in August, and the calf is dropped in May. The male is known distinctively as the hart (or stag), the female as the hind. The stag is represented in North America by the wapiti, which is even larger. See Wapiti.

STAG BEETLE, the common stag beetle is one of the largest of insects, and is especially distinguished by the enormous size of the horny and toothed mandibles in the males.



Stag beetle.

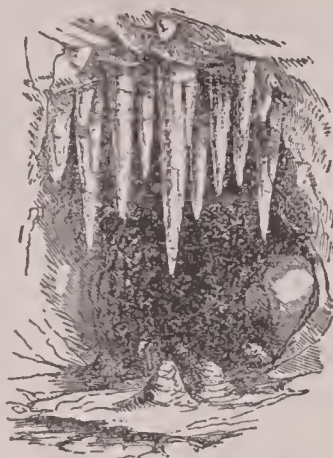
STAGECOACH. See Coach.

STAGGERS is the vague and popular name of certain diseases of horses and sheep. In the horse mad or sleepy staggers is due to inflammation of the brain, while grass or stomach staggers arises from acute indigestion, generally the result of overfeeding on wet grass. In sheep the staggers is caused by the presence within the brain of the immature embryo of a species of tapeworm which, in its mature state, is found in the intestines of the dog.

STAINED GLASS is glass painted with metallic oxides or chlorides, ground up with proper fluxes and fused into its surface at a moderate heat. See Glass-painting.

STALAC'TITES, masses of calcareous matter, usually in a conical or cylindrical form, pendent from the roofs of caverns, and produced by the filtration of water containing particles of carbonate of lime through fissures and pores of rocks. Similar masses of small size are frequently to be seen also depending from stone bridges. The water being evaporated leaves a deposit of lime behind it, which, by the continued trickling of the water, gradually increases in size. Simultaneously with the formation

of the stalactite a similar but upward growth, called a stalagmite, takes place at the spot vertically below where the successive drops of water fall and evaporate. This sometimes forms con-



Cave with stalactites and stalagmites.

tinuous sheets over the surface, sometimes rises into columns, which meet and blend with the stalactites above.

STAMBOUL. See Constantinople.

STAMENS, in botany, the male organs of fructification in plants, formed principally of cellular tissue. They are situated immediately within the petals, and are each composed, in most cases, of three parts, the filament, the anther, and the pollen (contained in the anther), of which the two latter are essential, the other not. The stamens and pistils constitute the sexual or reproductive organs of plants. Generally they both exist in the same flower, which is thus said to be hermaphrodite or perfect. The number of stamens varies in different plants, from one to a hundred or more. With respect to their directions they are named erect, inflexed, reflexed, spreading, ascending, declinate; and their insertions with regard to the ovary are said to be hypogynous, epigynous, or perigynous. It was on the number of stamens and their arrangements and



Inside of corolla showing the stamens.

relations, that Linnæus founded the classes of his sexual system of plants. See Botany, Anther, Pollen.

STAMFORD, a town in Fairfield co., Connecticut, near the mouth of the Mill river, 36 miles northeast of New York, for the inhabitants of which it is a favorite summer resort. It has woolen and iron manufactures, and a small coasting trade. Pop. 17,306.

STAMMERING, an affection of the faculty of speech characterized by irregular, imperfect, or spasmodic actions of the muscles concerned in articulation. It manifests itself in a difficulty in beginning the enunciation of words, especially such as begin with an explosive consonant, or in a spasmodic and for a time an uncontrollable reiteration

of the same syllables after the word is begun; this latter defect being also called stuttering. Stammering is always increased by emotional disturbance, and is much mitigated and often cured, by the patient acquiring confidence in himself, never attempting to speak in a hurry or when the chest is empty of air, or by reading measured sentences slowly and with deliberation.

STAMP, a term specifically applied to the public mark or seal made by a government or its officers upon paper or parchment whereon private deeds or other illegal agreements are written, and for which certain charges are made for purposes of revenue. The name is also applied to a small piece of stamped paper issued by government, to be attached to a paper, letter, or document liable to duty.

STAMP ACT, an act regulating the imposition of stamp duties; especially, an act passed by the British parliament in 1765, imposing a duty on all paper, vellum, and parchment used in American colonies, and declaring all writing on unstamped materials to be null and void. This act roused a general opposition in the colonies, and was one cause of the revolution.

STANDARD, a flag or carved symbolical figure, etc., erected on a long pole or staff, serving as a rallying-point or the like. In a more strict sense the term is applied to a flag which bears the arms, device, or motto of the owner, long in proportion to its depth, tapering toward the fly, and, except when belonging to princes of the blood-royal, slit at the end.

STANDARD OF MONEY, in coinage, the proportion of weight of fine metal and alloy established by authority. The standard of gold coins in the United States is at present 25.8 grains to the dollar. The standard of silver coins is 412.5 grains to the dollar. The fineness to be 9 parts of gold or silver to 1 of alloy.

STANDING STONES, are large rough, erect monoliths found not only in all parts of Europe, but also in some countries of the East and even in the New World, and nowhere more common than in Great Britain. They sometimes occur singly, sometimes in groups. The principal purposes of the single standing stones appear to have been to serve as boundary-marks, as memorials of battle, and as sepulchral monuments. The groups of standing stones that exist in various parts of Great Britain, as well as in some parts of the continent, were thought by antiquaries to be connected with the Druidical worship of the Celts, but, for want of sufficient evidence, this theory has been abandoned.

STANDISH, Miles, born in Lancashire about 1584, died 1656. He claimed to be the descendant of the Standish family of Duxbury Hall, served as a captain in the Netherlands, and joined the Puritans when they sailed for New England in the Mayflower (1620). He took an active part in the early struggles of the colony, and a tradition regarding his courtship is celebrated in a well-known poem by Longfellow.

STANFORD, Leland, American capitalist, was born at Watervliet, N. Y., in

1824. He removed to California in 1852, and engaged in mining and commercial ventures. He was a delegate to the Chicago convention that nominated Abraham Lincoln. In 1861 he was elected governor of California; also president of the Central Pacific; to the construction of which he gave his personal attention. In 1885 and 1891 he was elected to the United States senate. In 1886

the New York Herald he joined the Abyssinian expedition of 1867-68. He afterward traveled in Spain, and it was while there in 1869 that he was asked by the proprietor of the New York Herald "to go and find Livingstone." He met and relieved the traveler at Lake Tanganyika in November of the same year and returned to England. As correspondent of the Daily Telegraph and the New



Standing stones of Stennis, Pomona, Orkney.

he donated the sum of \$20,000,000 to the State of California for the purpose of founding the Leland Stanford Junior University in memory of his son. See Leland Stanford Junior University. He died in 1893.

STANISLAUS AUGUSTUS, Stanislaus II., the last king of Poland, son of Count Stanislaus Poniatowski, was born at Wolczyn in Lithuania 1732, died 1798. He protested against the various partitions of Poland, formally resigned his sovereignty in 1795, and finally died in St. Petersburg as a pensioner of the Emperor Paul I.

STANISLAUS LESZCZYNSKI (lesh-chin'ski), Stanislaus I., King of Poland, afterward Duke of Lorraine and Bar, was born at Lemberg in 1677, died 1766. He was recommended to the Warsaw assembly by Charles XII. of Sweden as a candidate for the vacant throne of Poland. He was accordingly elected and crowned (1705), but after the disastrous battle of Poltava (1709), when his patron Charles XII. was defeated, he had to flee from Poland. He found refuge in France ultimately, where his daughter Maria became wife to Louis XV. Assisted by the French king he sought to establish his claim to the throne of Poland in 1733, but, opposed by the united powers of Saxony and Russia, he had again to retire into France, where he held possession of the duchies of Lorraine and Bar until his death.

STANLEY, Sir Henry Morton, born near Denbigh, in 1840, was placed in the poorhouse of St. Asaph at the age of three; subsequently in 1855 shipped as cabin boy to New Orleans. Stanley enlisted in the confederate army, where he was taken prisoner, but after his discharge he volunteered into the United States navy. At the close of the war he went to Turkey as a newspaper correspondent, and as war correspondent for

York Herald he in 1874 undertook an expedition into Africa, and for the first time traced the Congo river from the interior to its mouth (1877). For the purpose of developing this vast region he returned in 1879, and after planting stations and establishing steam navigation this territory secured by Stanley was named in 1885 the Congo Free State.



Henry Morton Stanley (Jan. 1886).

He is the author of *How I Found Livingstone*, *Through the Dark Continent*, *The Congo*, and *The Founding of its Free State*, and *In Darkest Africa*. He was made G.C.B. in 1899. Died 1904.

STANLEY FALLS. See Congo Free State.

STANTON, Edwin M'Masters, an American statesman, was born at Steubenville, Ohio, 1814; died at Washington 1869. He acquired a large practice in the supreme court at Washington, and when Buchanan was elected president (1857) he entered the cabinet. Shortly after the outbreak of hostilities between the north and the south, President Lincoln appointed him head of the war department (January, 1862), and his acceptance of the office marked the beginning of a vigorous military policy.

He selected General Grant for promotion after the victory at Fort Donelson; and it was he who, in 1863, placed Grant in supreme command of the three armies operating in the southwest. In all the important movements of the war Stanton was consulted by the president. After the assassination of Lincoln he had some controversy with his successor, Andrew Johnson, who demanded his resignation. This he refused, and was upheld by the senate. In 1869 he was appointed justice of the supreme court, but he died a few days afterward.

STANTON, Elizabeth (Cady), American reformer and promoter of the woman's rights movement, was born at Johnstown, N. Y., in 1815. She became interested in the anti-slavery and other reform movements, and through acquaintance with Lucretia Mott was led to sign the call for the first woman's rights convention, which was in July, 1848. This convention made the first formal demand for the extension of the suffrage to women, and of the National Women's Suffrage association there formed Mrs. Stanton became the first president, retaining that office until 1893. In 1868 she was a candidate for congress. She was a frequent contributor to magazines, and was joint author of *A History of Woman's Suffrage*. *Eighty Years and More*, an autobiography, was published in 1895. She died in 1902.

STANZA, in poetry, a number of lines or verses connected with each other, and properly ending in a full point or pause. A stanza presents in meter, rhymes, and the number of its lines a combination which repeats itself several times in the course of the same poem.

STAPE'LIA, an extensive and curious genus of plants or milkweeds. Most of the species are natives of the Cape of Good Hope. They are succulent plants, without leaves, frequently covered over with dark tubercles, giving them a very



Stapelia variegata.

grotesque appearance. In most instances the flowers give off a very unpleasant odor. They are, nevertheless, cultivated on account of their singular and beautiful flowers.

STAPHYLO'MA, a name given to different tumors of the anterior surface of the globe of the eye. Called also staphylosis.

STAR, Polar. See Pole-star. There is a Swedish order of knighthood so named. It is bestowed specially on those who have distinguished themselves in a civil capacity. Its motto is, "Nescit occasum."

STAR-APPLE, the popular name of several species of plants whose fruit is esculent. It is a native of the West

Indies. The fruit resembles a large apple, which in the inside is divided into ten cells, each containing a black seed,



Star-apple.

surrounded by a gelatinous pulp, which is very palatable.

STARBOARD, the right side of a ship when the eye is directed toward the head, stem, or prow. See Port.

STARCH, a proximate principle of plants, universally diffused in the vegetable kingdom, and of very great importance. It occurs in seeds, as in those of wheat and other cereal grains, and also in leguminous plants; in roots, as in the tubers of the potato; in the stem and pith of many plants, as in the sago plant; in some barks, as in that of cinnamon; and in pulpy fruits, such as the apple. Finally, it is contained in the expressed juice of most vegetables, such as the carrot, in a state of suspension, being deposited on standing. The starch of commerce is chiefly extracted from wheat flour and potatoes. When pure, starch is a snow-white powder of a glistening appearance, which makes a crackling noise when pressed with the finger. It is composed of transparent rounded grains, the size of which varies in different plants, those of the potato being among the largest, and those of wheat and rice the smallest. It is insoluble in cold water, alcohol, and ether; but when heated with water it is converted into a kind of solution, which, on cooling, forms a stiff semi-opaque jelly. If dried up this yields a translucent mass, which softens and swells into a jelly with water. It is employed for stiffening linen and other cloth. When roasted at a moderate heat in an oven it is converted into a species of gum employed by calico-printers; potato starch answers best for this purpose. Starch is convertible into sugar by boiling with dilute sulphuric acid. Starch forms the greatest portion of all farinaceous substances, particularly of wheat flour, and it is the chief ingredient of bread.

STAR-CHAMBER, formerly an English court of civil and criminal jurisdiction at Westminster. It consisted originally of a committee of the privy-council, and was remodeled during the reign of Henry VII., when it consisted of four high officers of state, with power to add to their number a bishop and a temporal lord of the council, and two justices of the courts of Westminster. It had jurisdiction of forgery, perjury, riots, maintenance, fraud, libel, and conspiracy, and could inflict any punishment short of death. Its process was summary and

often iniquitous (especially in the reigns of James I. and Charles I.), and the punishment it inflicted often arbitrary and cruel. This court was abolished (1640) by statute 16 Charles I.

STAR-FISHES, the star-fishes proper are covered with a tough leathery skin beset with prickles, and have the form of a star, with five or more rays radiating from a central disc. In the middle of the under surface of the disc is situated the mouth, opening into a digestive system which sends prolongations into each ray. If the prickly skin be removed it will be seen to be supported by a series of plates beautifully jointed together. On the under surface of each ray the plates exhibit a series of perforations, through which, in the living state, the ambulacra or tubular feet can be protruded so as to effect locomotion. Star-fishes are found in almost all tropical and European seas, and some species are found as far north as Greenland.

STARLING, called also Stare, a bird belonging to a family of birds widely distributed throughout the world, and allied to the crows. The common starling is between 8 and 9 inches in length; the color is blackish, with blue, purplish, or cupreous reflections, and each feather is marked at the extremity with a whitish triangular speck, giving



Common European starling.

the bird a speckled appearance. Starlings live mostly upon insects, build in old walls and hollow trees, and the eggs, usually five, are of a pale bluish tint. These birds are often kept in cages, and may be taught to whistle some tunes, and even to pronounce words and sentences.

STAR OF BETHLEHEM, a bulbous-rooted plant with white star-like flowers. It is common in many parts of Europe, and is much cultivated in gardens for ornament.

STARS, those self-shining bodies seen in the heavens at night, constituted like the sun, situated at immense distances from us, and doubtless like our sun, the centers of systems similar to our own. To superficial observation stars are distinguished from planets by remaining apparently immovable with respect to one another, and hence they were called fixed stars, although their fixity has been disproved in numerous cases, and is no longer believed in regard to any. In order to distinguish the stars one from another the ancients divided the heavens into different spaces containing

groups of stars called constellations. (See constellation.) The stars are divided, according to their brightness, into stars of the first, second, third, etc., magnitudes; but no magnitude, in the proper sense of the word, has yet been observed in any star. All the stars beyond the sixth or seventh magnitude are called telescopic stars, as they cannot be seen without the aid of the telescope; and these are continued by astronomers down to the sixteenth magnitude. As to the absolute size of the stars little is known; but the light given out by Sirius is estimated at $63\frac{1}{2}$ times that of the sun. The colors of the stars vary considerably, red, yellow, green, and blue being noticed. The stars are very irregularly distributed over the celestial sphere. In some regions scarcely a star is to be seen, while in others they seem crowded together, especially in the Milky Way. In some cases a certain number of stars evidently belong to a system by themselves. Of the stars visible to the naked eye at any one time the number probably does not exceed a few thousands, but in the telescope their number is so great as to defy all calculation. The distances of the stars from the earth are very great. The shortest distance yet found, that of α Centauri, a double star in the southern hemisphere, has been calculated at 20 billions of miles, so that the light takes $3\frac{1}{2}$ years to travel from it to our earth. Many stars have been observed whose light appears to undergo a regular periodic increase and diminution of brightness, amounting, in some instances, to a complete extinction and revival. These are called variable and periodic stars. It is found that some stars, formerly distinguished by their splendor have entirely disappeared. Such stars are called temporary stars. Many of the stars that usually appear single are found, when observed with telescopes of high magnifying power, to be really composed of two, and some of them three or more stars in close juxtaposition. These are termed double and multiple stars. By means of spectrum analysis some valuable results regarding the stars have latterly been obtained; in particular, many of the elements familiar to us have been detected in them, and the spectroscope has also proved that the star Arcturus is approaching us and Sirius receding. See Astronomy, Nebulæ, and Meteor.

STARS AND BARS, the popular name applied to the flag adopted by the confederate states of America early in 1861. See Flag.

STAR SPANGLED BANNER, The, the national hymn of the United States, written by Francis Scott Key on board the frigate *Surprise* during the bombardment of Fort McHenry, Md., by the British, in 1814. "The Star Spangled Banner" was first sung in a tavern near the Holiday Street theater, Baltimore, by Ferdinand Durang.

STARVATION, or **INANITION**, is the physical effect produced by the total want of food and water. The symptoms of starvation in man are: an increasing loss of weight, severe pain in the stomach, loss of strength, sleeplessness, great thirst, in some cases stupor, and

in other cases nervous excitement with convulsions. Meanwhile the face assumes a haggard expression, the skin is said to become covered with a brown secretion, and at last death occurs in about eight days. With a good supply of water, however, life may be prolonged, in the absence of solid food, for a period of two or three weeks, and a moist atmosphere will even seem to favor the prolongation of life. Certain diseases, such as stricture or cancer of the opening of the stomach, etc., may occasion starvation, and it is to be noted that gradual starvation may result from the continued low percentage of nutritive matter in the daily diet. See Fasting.

STATEN ISLAND, an island belonging to New York state, constituting nearly the whole of Richmond county, and separated from Long Island by the Narrows which form the entrance to New York harbor, and from New Jersey by Staten Island sound, about $\frac{1}{4}$ mile broad. Its length is 14 miles, and its greatest breadth 8 miles. It contains numerous villages, abounds in pleasant scenery, and has constant communication with New York by steam ferry-boats.

STATES-GENERAL, thus called to distinguish them from the provincial states, the name given in France till 1789 to the assemblies of the deputies of the three orders of the nation, the clergy, the nobility, and the third estate. This assembly had little legislative power, its chief function being to register the king's decrees in matters of taxation.

STATE, Department of, one of the nine executive departments of the government of the United States, presided over by a secretary who is a member of the cabinet and first in the line of succession to the presidency after the vice-president. The department of state is the organ of communication between the government of the United States and all foreign governments, as well as with the governors of the individual states. The secretary of state conducts all such correspondence; has charge of the negotiation of all treaties and conventions; he preserves the originals of all treaties, public documents and correspondence with foreign governments as well as of the laws of the United States; he publishes all statutes and resolutions of congress and proclamations of the president; he is the custodian of the great seal which is affixed to all commissions of appointment requiring the consent of the senate, proclamations, warrants for extradition, pardons, etc., emanating from the president; he issues and keeps a record of passports granted to American citizens traveling abroad; issues warrants for the extradition of criminals to be delivered to foreign governments; presents foreign ministers to the president, etc. He makes an annual report of the conduct of foreign affairs for the year, publishes the consular reports and the "foreign relations" of the United States, and performs such other duties relative to the conduct of foreign affairs as the president may direct.

STATES AND TERRITORIES, Popular Names of, Alabama, Cotton state; Arkansas, Toothpick and Bear state;

California, Eureka and Golden state; Colorado, Centennial state; Connecticut, Land of Steady Habits, Freestone state and Nutmeg state; Dakota, Sioux state; Delaware, Uncle Sam's Pocket Handkerchief and Blue Hen state; Florida, Everglade and Flowery state; Georgia, Empire state of the South; Idaho, Gem of the Mountains; Illinois, Prairie and Sucker state; Indiana, Hoosier state; Iowa, Hawkeye state; Kansas, Jayhawker state; Kentucky, Corn-cracker state; Louisiana, Creole state; Maine, Timber and Pine Tree state; Maryland, Monumental state; Massachusetts, Old Bay state; Michigan, Wolverine and Peninsular state; Minnesota, Gopher and North Star state; Mississippi, Eagle state; Missouri, Puke state; Nebraska, Antelope state; Nevada, Sage state; New Hampshire, Old Granite state; New Jersey, Blue state and New Spain; New Mexico, Vermin state; New York, Empire state; North Carolina, Rip Van Winkle, Old North and Turpentine state; Ohio, Buckeye state; Oregon, Pacific state; Pennsylvania, Keystone, Iron and Oil state; Rhode Island, Plantation state and Little Rhody; South Carolina, Palmetto state; Tennessee, Lion's Den state; Texas, Lone Star state; Utah, Mormon state; Vermont, Green Mountain state; Virginia, Old Dominion; Wisconsin, Badger and Copper state.

STATICS, that branch of dynamics which treats of the properties and relations of forces in equilibrium—equilibrium meaning that the forces are in perfect balance, so that the body upon which they act is in a state of rest. According to the classification still employed by many writers on the subject the word statics is used in opposition to dynamics, the former being the science of equilibrium or rest, and the latter of motion, both together constituting mechanics. But among more recent authors mechanics is used to express not the theory of force and motion, but rather its application to the arts. The word dynamics is employed as expressing the science which treats of the laws of force or power, thus corresponding closely to the old use of the term mechanics; and this science is divided into statics and kinetics, the first being the science which treats of forces considered as producing rest, and the second as treating of forces considered as producing motion. See Dynamics.

STATISTICS, a collection of facts relating to a part or the whole of a country or people, or of facts relating to classes of individuals or interests in different countries; especially, those facts which illustrate the physical, social, moral, intellectual, political, industrial, and economical condition or changes of condition, and which admit of numerical statement and of arrangement in tables. The collection of statistics may have the object merely of ascertaining numbers, as is often the case with statistics collected for purely administrative purposes; or it may be undertaken with the view of learning what happens on an average of a great number of cases, as is the case of insurance statistics; or its object may be to detect the causes of phenomena that

appear in the consideration of a number of individual cases—such phenomena, for example, as the decline of a certain trade, the prevalence of a certain disease, etc. In all civilized countries the collection of statistics forms an important part of the administrative duties of government, and in some cases it is intrusted to a special bureau. The first country to possess an institution of this nature was Belgium, its organizer being the eminent statistician Lambert Quetelet.

STATUE. See Sculpture.

STATUTE, a law proceeding from the government of a state; a written law. Statutes are either public or private (in the latter case affecting an individual or a company); but the term is usually restricted to public acts of a general and permanent character. Statutes are said to be declaratory of the law as it stood before their passing; remedial, to correct defects in the common law; and penal, imposing prohibitions and penalties. The term statute is commonly applied to the acts of a legislative body consisting of representatives. In monarchies not having representative bodies, the laws of the sovereign are called edicts, decrees, ordinances, rescripts, etc.

STAVRO'POL, a government of Russia in the Caucasus, and bordering on the Caspian sea; area, 26,500 sq. miles. Pop. 876,298.—Stavropol, the capital of this district, is strongly fortified, and has a large trade in horses, cattle, sheep, etc. Pop. 41,621.

STAY, in ships, a large, strong rope, extending from the upper end of a mast down to another mast, or to some part of the vessel, with the object of lending support to the mast to whose top it is attached. Those leaning forward are called fore-and-aft stays, and those leading down to the vessel's sides and pulling a little backward are called back stays. A sail extended on a stay is a stay sail. In large vessels there are a number of these of a triangular shape. To stay is to tack or bring the ship's head up to the wind for going about; to miss stays is to fail in the attempt to go about. In stays or hove in stays is the situation of a vessel when she is in the act of going about.

STEAD, William Thomas, English journalist, was born at Embleton, Northumberland in 1849. In 1880 he was assistant editor of the Pall Mall Gazette; editor from 1883 to 1889. In 1890 founded the Review of Reviews. By his exposure of legally permissible outrages upon women and children in his Maiden Tribute of Modern Babylon in 1885 he was sentenced to a three months' term in Holloway gaol, but it was followed by the enactment of the Criminal Law Amendment Bill. His publications include: The Truth About Russia, The Pope and the New Era, If Christ Came to Chicago, The Labor War in the United States, Satan's Invisible World, A Study of Despairing Democracy, The Americanization of the World.

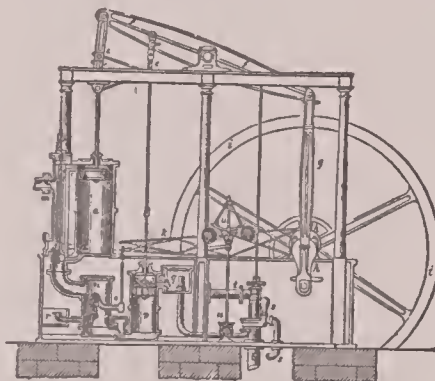
STEALING. See Larceny.

STEAM, is the vaporous substance into which water is converted under certain conditions of heat and pressure. It may be said, indeed, that water gives off vapor or steam at every temperature,

but the term is technically applied to the elastic aciform fluid generated by heating water to the boiling point. Steam, in its perfect state, is transparent, colorless, and invisible; but when it has been deprived of part of its heat by coming into contact with cold air, it suddenly assumes a cloudy appearance, and is condensed into water. When water, in an open vessel, is heated to the boiling point (212° F.) globules of steam are formed at the bottom and rise to the surface, where they pass off in vapor. In this case all the heat which enters into the water is solely employed in converting it into steam of the temperature of boiling water, while the continued and increased application of heat will only cause a more rapid formation of steam until the whole of the water evaporates. When water, however, is confined in a strong close vessel, both it and the steam which it produces may be brought to any temperature; and as steam at boiling point occupies 1642 times the space of the water from which it is generated, it follows that when thus confined it must exercise an enormous expansive force. Steam, as used in the steam-engine, holds water in suspension mechanically, and is called saturated steam; while the steam which receives additional heat apart from water is called superheated steam, and approximates to the condition of a perfect gas. When the temperature of saturated steam is considerably above 212° F., the steam formed under such conditions is termed high-pressure steam while at 212° F it is called low-pressure steam, and its pressure is equal to that of one atmosphere, or 14.7 lbs. on the square inch. Another element in the constitution of steam is its density which is expressed by the weight of 1 cubic foot of the steam. This density is increased with an increase of the pressure under which the steam is generated, for the particles of steam become more closely packed together. Thus the density of steam produced at 212° has been found to be equal to .038 lb. or $\frac{5}{8}$ oz. per cubic foot, from which it follows that the volume of 1 lb. of such steam is equal to 26.36 cubic feet. Like the pressure or expansive force of steam, the density is invariably the same for a given temperature. From the possession of the properties thus briefly stated, steam constitutes an invaluable agent for the production of mechanical force, as shown in the various uses of the steam-engine. It is also employed in distributing the heat used for warming buildings, in heating baths, evaporating solutions, brewing, drying, dyeing, and even for cooking.

STEAM-ENGINE, a mechanical contrivance, in which the force arising from the elasticity and expansive action of steam, or from its property of rapid condensation, or from the combination of these qualities, is made available as a source of motive power in the arts and manufactures, and in locomotion. The expansive power of steam was known to the ancients, and its earliest use in connection with a mechanical contrivance is noted by Hero of Alexandria (about 130 B.C.) in his *Pneumatica*. In this treatise Hero describes an æolipile or

hollow spherical vessel turning on an axis, supplied with steam, and driven by the reaction from the escaping jets of steam. The principle that a mechanical power is obtained by the pressure of steam acting on the surface of water placed in a closed vessel put to practical use by Captain Thomas Savery (1698) in a steam-engine which he constructed for the purpose of raising water out of mines; and with the elevation of water by pressure he also combined the principle of obtaining a vacuum by condensation. This principle, however, was made more practically effective by Denis Papin (1690), who constructed a steam-engine in which a piston was forced down through the vacuum made by condensation. This first conception of a piston working in a cylinder was further developed by Newcomen (1705) and his assistant Cavley. Various improvements in the steam-engine were made by Smeaton and others, but its greatest development was effected by James Watt (1769). His improvements consisted in condensing the steam, not in the cylinder, but in a separate condenser, thus preventing the waste occasioned previously by the chilling



Beam condensing steam-engine.

a, The steam-cylinder. b, The piston. c, The upper steam-port or passage. d, The lower steam-port. ee, The parallel motion. ff, The beam. g, The connecting-rod. h, The crank. ii, The fly-wheel. kk, The eccentric and its rod for working the steam-valve. ll, The steam-valve and valve-casing. m, The throttle-valve. n, The condenser. o, The injection-cock. p, The air-pump. q, The hot-well. r, The snifting-valve for creating a vacuum in the condenser previous to starting the engine. s, The feed-pump for supplying the boilers. t, The cold-water pump for supplying the condenser cistern. u, The governor.

and heating of the cylinder. Besides this, he preserved the heat in the cylinder by surrounding it with a layer of hot steam inside of an external casing; and with the same object he employed steam, instead of air, to press down the piston from above. Thus he obtained the double-acting engine, which is so named because both the up-stroke and the down-stroke are produced by means of steam. Further, he devised a crank motion which converted the alternating motion of the oscillating beam into a continuous rotary motion; but as this invention was pirated he patented the "sun-and-planet" wheel as a substitute for the crank, returning afterward to the crank. To these improvements he subsequently added a fly-wheel, in order to equalize the motion so as to drive the crank past the dead-points; a governor, whose purpose was to regulate the quantity of steam passing into the cylinder; an indicator, to measure the pressure upon the piston; and a slide-valve, moved automatically by an

eccentric, the object of which was to regulate the action of the steam in the cylinder. The steam-engine, as thus developed by Watt, was in nearly all essential points the same as the present-day engine. Probably the only improvement of primary importance which has been made in the steam-engine since the time of Watt, is the manner in which steam is now used expansively. In the compound engine the steam receives the greater part of its expansion in a second cylinder of much larger diameter than the first, and by this means greater steadiness of piston-stroke, economy of fuel, and increased driving power have been obtained. The use of expanded steam has been especially notable in the marine engine, where it is now expanded successively in three or even four cylinders. The accompanying illustration represents a sectional elevation of a beam condensing steam-engine, and shows the principles embodied in Watt's steam-engine. The pipe conveying the steam from the boiler opens into the part marked l, which incloses a movable valve by means of which the steam may be alternately admitted into the cylinder a by the upper port c and lower d; between these points the piston b works steam-tight. The valve l is so contrived that while it allows steam to pass into the cylinder through one of the ports, it shall at the same time open a communication between the opposite side of the piston and the condenser n, which is a hollow vessel kept constantly immersed in cold water, a portion of which is admitted into it by the injection-cock o; consequently, the steam thus admitted is instantly deprived of its heat, and reconverted into its original form of water, thereby forming a vacuum. Thus it will be seen that, on the communication being opened up between the boiler and either side of the piston, the latter will ascend or descend in the cylinder unimpeded by the resistance of the atmosphere against the other side, and with a force proportional to the pressure of the steam; and as the motions of the steam-valve l are regulated by the engine itself, the above action is kept up continuously. The alternating rectilinear motion thus generated within the cylinder is transmitted by means of a rod attached to the piston, to a strong beam ff, movable upon a central axis, a system of jointed rods ee, called the parallel motion, being interposed for the purpose of neutralizing the disturbing action which the circular path of the beam would otherwise exert upon the piston. The reciprocating motion of the beam is now, through the intervention of the connecting-rod g and crank h, converted into a circular or rotatory motion, which is rendered continuous and uniform by the fly-wheel i, to the axis of which the machinery to be impelled is connected. The air-pump p for withdrawing the vapor and water from the condenser, the feed-pump s for supplying the boilers, and cold-water pump t for supplying the condenser cistern, are all worked by rods from the beam; and the governor u, for maintaining uniformity of motion, is driven by a band from the crank-shaft. The above description

refers more immediately to that class of steam-engines called low-pressure engines. The various forms of the steam-engine have received a varied form of classification. There are the general divisions into condensing and non-condensing engines, compound and non-compound, and single, double, or direct acting. Again there is the classification connected with the position of the cylinder, as in the horizontal, vertical, and inclined cylinder engines. Another classification, and that which is adopted here, is to divide steam-engines into the uses to which they are applied. Stationary engines comprise all such engines as are permanently fixed for the purpose of driving the machinery in a factory, pumping water, etc. For a long time the favorite engine for these purposes was of the beam condensing type adopted and improved by Watt. But this has now, for the most part, been superseded by an engine the cylinders and connections of which are horizontal. In the most modern type the cylinder is fixed endwise to a base plate at one extremity, the crank-shaft has its bearings on the same base at the other extremity, and the piston-rod driven horizontally is guided by means of a crosshead, the ends of which slide between two parallel bars fixed on the frame. The Corliss engine is a well-known type of horizontal engine, its characteristic feature being the system of reciprocating valves by which the steam is passed to and from the cylinder. In some engines, especially such as are used as winding engines, a pair of coupled horizontal cylinders are now used; and in the larger form of horizontal engine two cylinders of high and low pressure are placed either side by side or one before the other. In cases where the cylinders are vertical the other general arrangements are much the same as in the horizontal engine. In portable engines the boiler and engine go together, the boiler being undermost; and the whole is supported upon four wheels, by means of which it is moved from place to place. The chimney is turned down over the boiler when not in use. A kind of engine known as semi-portable consists of a boiler and engine placed together, but without wheels. The road-locomotive was first suggested by William Symington in Scotland, and developed for practical purposes about 1800 by Oliver Evans in America and Trevethick in Wales. The chief characteristics of this traction engine, as it is called, is the great width of the wheels, which are now supplied by some makers with protected india-rubber tires to prevent slipping. It can be made to run backward and forward by means of reversing gear, while its course is guided by a steering wheel acting upon a vertical shaft. The railway-locomotive is a steam-engine and boiler placed upon wheels and employed to transport a train of cars upon a railway. It was not, however, until 1829 that the modern high-speed locomotive came into use. The "Rocket" built by George Stephenson, in 1829, ran on four wheels, weighed 4 tons 5 cwt., and the tender, consisting of a simple cask, 3 tons 4 cwt.; the steam cylinders were 8 inches in diame-

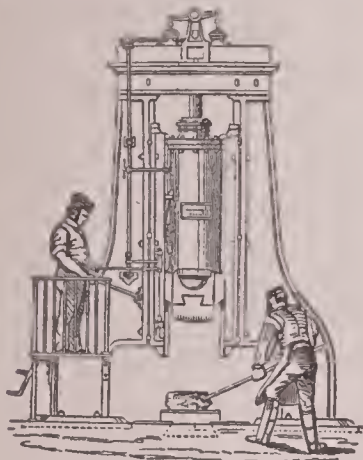
ter with $16\frac{1}{2}$ inches of stroke; the driving-wheels were 4 feet $8\frac{1}{2}$ inches in diameter; the total gross weight drawn was about 17 tons; and the speed attained was an average of 14 miles per hour, with an occasional speed of 29 miles per hour. In this engine of the "Rocket" there were brought together the three primary elements which, having been developed, make the efficiency of the modern locomotive—viz., the internal water-surrounded fire-box and the multitubular flue in the boiler; the blast-pipe, from which the waste steam of the engine was exhausted up the chimney; and the direct connection of the two steam cylinders, one on each side of the engine, with the driving-wheels, on one axle. From this early locomotive the two modern types, differentiated by the position of the cylinder, have been developed. In the inside cylinder locomotive the cylinder is situated within the framing, under the boiler, with the main driving-axle cranked at two points to receive the power from the two cylinders; while in the outside cylinder locomotive the cylinder is external to the framing and connected, not to the axle, but to the crank-pins fixed between the spokes of the wheels in connection with the nave. Another point of advance on the early locomotive is in the number of the wheels. These now vary from six to twelve, and in some locomotives, where heavy loads are drawn on inclines, a greater tractive power is secured by coupling three or even four wheels together upon one side. The principle of the expansion of steam in high-pressure and low-pressure cylinders has also been adopted, in order to save fuel, in some recent locomotives. The express passenger engine of the modern type now forms a striking contrast to the engine of the "Rocket;" it weighs nearly 50 tons in working order, and with the loaded tender, about 80 tons gross; its cylinders are from 17 to 19 inches in diameter, with a stroke of about 26 inches; the driving-wheels are from 7 to 8 feet in diameter; and the speed attained, about 54 miles per hour. The modern freight engine is capable of drawing a train weighing 672 tons up an incline of 1 in 178, this being equivalent to a gross weight, including engine and tender, of 1816 tons on a level. The earliest form of marine engine seems to have been devised by Patrick Miller of Dalswinton, and constructed in Edinburgh (1788) by William Symington. Its cylinders were 4 inches in diameter, and it was able to drive a pleasure-boat 25 feet long, with two central paddle-wheels, at a speed of 5 miles an hour. Subsequently Symington constructed (1801) an engine on Watt's double-acting principle, and with a stern-wheel, which was used on a canal in Scotland, in a steamboat called the Charlotte Dundas. This engine was seen by Robert Fulton, who employed (1807) an English firm to build a similar engine for a steamer called the Clermont, which he afterward successfully employed upon the Hudson river in America. In Great Britain the first passenger steam vessel was the Comet built (1812) at Port-Glasgow by John Wood to the order of Henry

Bell, who employed it to ply between Glasgow and Greenock. The Comet, which had side paddle-wheels and was about 42 feet long and 11 feet wide, was driven by a kind of inverted beam-engine, with a single vertical cylinder, developing four or five horse-power. These early marine engines were constructed in a manner similar to Watt's land engine, but the position of the beam so high above the deck was soon recognized as a defect, especially in sea going steamers. Instead, therefore, of a beam placed above the cylinder and piston, two beams or levers were placed below, one on each side of the engine, and the connecting-rod conveyed the power to the crank upward instead of downward. This design, however, was soon afterward discarded in favor of an arrangement by which the cylinder was placed beneath and connected directly with the crank. A further improvement was secured by an oscillating cylinder, which moved right and left with the swing of the crank and enabled the piston-rods to be connected directly with the cranks. When the paddle-wheel was superseded by the screw-propeller a totally different type of marine engine was required. In this case the cylinder was inverted and placed above the shaft of the screw near the deck, and the connection with the crank was formed by means of an ordinary connecting-rod. In ships-of-war a horizontal direct-acting engine was adopted in order to keep the machinery below the water-line and out of danger from the enemy's guns. This took various forms, such as Penn's trunk-engine, where compactness was obtained by securing the connecting-rod directly to the piston and using the piston-rod as a hollow trunk within which the connecting-rod could oscillate freely; and the engine designed by Maudsley, in which two piston-rods proceed from each piston, and the connecting-rod is reversed so as to embrace the crank on the screw-shaft, near which the cylinder is placed. Recently, however, there is a tendency in war-ships to adopt the inverted vertical direct-acting engine as used in nearly all the large ocean steamers. These engines were commonly constructed with a two-cylinder compound arrangement, but this has been rapidly superseded by a three-crank triple-expansion engine first designed in 1874 by Mr. A. C. Kirk. This form of marine steam-engine has been found to effect a considerable saving in fuel, and the principle of expanding the steam has even been used in a four-cylinder quadruple-expansion engine with success.

STEAM-GAUGE. See Gauge.

STEAM-HAMMER, a machine employed in making large iron and steel forgings, and consisting usually of a steam-cylinder and piston with a metal striker placed vertically over an anvil. In the hammer invented by James Nasmyth about 1839, and patented in 1842, the first steam-hammer to come into practical use, the cylinder is fixed, and the hammer-head attached to the lower end of the piston-rod delivers its blows by the direct action of the steam in the cylinder. In operation the steam is introduced into the cylinder imme-

diately below the piston, and it raises the hammer between the guides to the required height. The steam being then cut off, and the exhaust-valve opened, the hammer descends with a velocity augmented by the compression of the air above the piston. As an improvement steam pressure is now also applied above the piston to increase the downward stroke of the hammer. By means of the valves and valve gearing the person in charge of the machine has complete control over the slightest movement of the hammer. In Condie's steam-hammer the piston-rod is attached to the top of the hammer frame,



Condie's steam-hammer.

and the cylinder is movable; the hammer head is attached to and falls with the cylinder, which thereby adds an additional weight to the blow. In the duplex steam-hammer patented by Ramsbottom the anvil is discarded, and two hammer-heads of equal weight deliver their blows upon the forging horizontally. From the increased size of gun forgings the steam-hammer has now attained enormous proportions, one erected by Krupp at Essen in 1888 being 150 tons. There is a probability, however, that steam will be superseded by hydraulic or pneumatic power in the largest hammers.

STEAM NAVIGATION, the navigation of ships in which steam is the sole or main propelling power. As early as 1736 Jonathan Hulls in England patented a method of propelling a vessel by steam by means of a stern wheel. In America James Rumsey and also John Fitch succeeded in 1786 in constructing each a vessel that was actually driven by steam; but the real precursor of the paddle-wheel steamer was constructed in 1788 by a Scottish landed proprietor, Patrick Miller of Dalswinton, on Dalswinton Loch, Dumfriesshire. This vessel, which was a double or twin boat, measured 25 feet in length by 7 feet in breadth, and was fitted with two paddle-wheels, one before and the other behind the engine. The mechanical part was constructed in Edinburgh under the superintendence of William Symington, and the speed attained was about 5 miles an hour. The following year a larger boat was built on the same principle and successfully tried on the Forth and Clyde canal. In 1801 Lord Dundas employed Symington to construct a

steamboat for use upon the Forth and Clyde canal. This vessel, which was launched in 1802 and named the Charlotte Dundas, had one paddle-wheel near the stern, and was driven by a direct-acting horizontal engine with a connecting-rod and crank. It was seen by Robert Fulton, an American engineer, who employed (1807) the English firm of Boulton and Watt to construct an engine upon the same principle, and this he fitted into a steamer called the Clermont, 130 feet long, which plied successfully upon the Hudson river. A number of steam-vessels were soon after plying on American waters. In 1819 the Savannah made the voyage to Liverpool from America in twenty-six days, its capacity as a sailing vessel being partly aided by steam. It was not until 1838, however, that regular steamboat communication was established across the Atlantic. In that year the Sirius steamed from London to New York in seventeen days; and a few months afterward the Great Western made the voyage from Bristol to New York in fifteen days. These were all paddle-steamers, and that type of vessel culminated in the Scotia (1861) of the Cunard line, which made the passage to New York in nine days. The measurements of this vessel were: length 366 feet, breadth 47 feet 6 inches; cylinder diameter 100 inches with a stroke of 12 feet, and the engines were of the side-lever type. Meanwhile various experiments were made with the screw propeller (which see). The first steamer in Great Britain fitted with a screw was the Archimedes (1839), built on the Thames; the first screw-ship in the British navy was the Dwarf (1843) and the first iron screw-steamer was the Fire Queen (1845), built at Glasgow. The modern type of ocean steamer is built of steel, and is represented by such vessels as the Kaiser Wilhelm der Grosse and the Lusitania, which make the voyage to America in less than five days. These are twin-screw vessels over 750 feet long, 88 broad, and have a displacement of 45,000 tons. See Ship.

STEAM PLOUGH. See Plough.

STEAM SHOVEL, the steam shovel was invented by an American named Otis, in 1840. It consists of a frame mounted on wheels to form a base to which the working parts are attached. The digging mechanism consists of a crane hinged to a mast at the front of the car and a dipper handle and dipper carried by the crane. The operating machinery consists of a main engine, which hoists the dipper and swings the crane, and of a thrusting mechanism for forcing the dipper into the earth. For digging blasted rock the front edge or lip of the dipper has steel teeth. The excavating capacity of steam shovels varies from 2400 cubic yards of sand to 600 cubic yards of loose rock per ten hours, with a $2\frac{1}{2}$ cubic yard dipper.

STEAM-WHISTLE, an arrangement connected with the boiler of a steam-engine for the purpose of making a loud whistling sound. In the locomotive steam-whistle a tube, fixed to the head of the boiler and opening into its interior, is commanded by a stop-cock, the tube ends in a portion perforated

with holes and surrounded by a thin brass cup; and the tube and cup are so adjusted as to leave a narrow opening all round. Above this opening a thin brass cup is fixed in an inverted position so as to present a sharp edge to the orifice. When the stop-cock is opened the steam rushes through this orifice with great violence, and in coming in contact with the sharp edge of the cup it produces a loud shrill sound. Steam-whistles can be made to give off musical tones by graduating the length of the pipe or cup.

STEAM-WINCH, a form of hoisting apparatus in which rotatory motion is imparted to the winding axle of the winch from the piston-rod of a steam-engine, either directly or indirectly.

STEARIC ACID is one of the most important and abundant of the fatty acids. As stearine it exists, in combination with glycerine, in beef and mutton fat, and in several vegetable fats. Stearic acid, which is inodorous, tasteless, insoluble in water but soluble in alcohol, forms white scaly crystals, and combines with alkalies, earths, and metallic oxides to form stearates. It burns like wax, and is used in making candles.

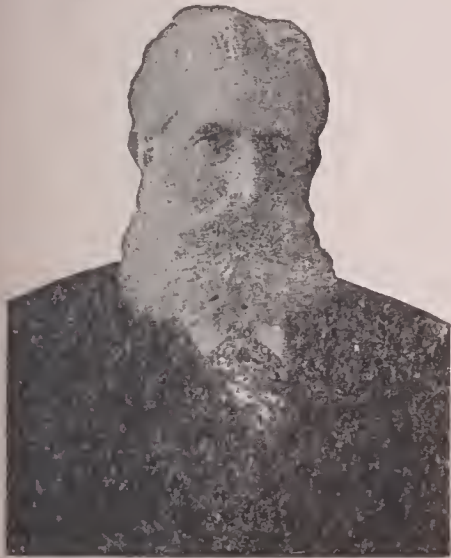
STEARINE, Stearin (stē'a-rin), the chief ingredient of suet and tallow, or the harder ingredient of animal fats, oleine being the softer one. It is obtained from mutton suet by repeated solution in ether and crystallization. It may also be obtained by pressing tallow between hot plates, and afterward dissolving in hot ether, which on cooling deposits the stearine. It has a pearly luster, is soft to the touch, but not greasy. It is insoluble in water, but soluble in hot alcohol and ether. When treated with superheated steam it is separated into stearic acid and glycerine, and when boiled with alkalies is saponified, that is, the stearic acid combines with the alkali, forming soap, and glycerine is separated. When melted it resembles wax.

STEDMAN, Edmund Clarence, American poet, was born in 1833 at Hartford, Conn. His chief volumes of verse are: Poems, Lyrical and Idyllic, Hawthorne and Other Poems, Lyrics and Idylls, and Poems Now First Collected. His prose works include The Victorian Poets and The Poets of America, and The Nature and Elements of Poetry. These volumes of critical writing he supplemented by A Victorian Anthology and an American Anthology. He was also editor, with Ellen M. Hutchinson, of A Library of American Literature, and, with George E. Woodberry of the Works of Edgar Allan Poe. He died in 1908.

STEATITE, or SOAPSTONE, a subspecies of rhomboidal mica. It is of two kinds, the common and the pagodite or lardstone. It is a compact stone, white, green of all shades, gray, brown or marbled, and is soapy or unctuous to the touch. It is used in the manufacture of porcelain, in polishing marble, in diminishing friction in machinery, and as the basis of rouge and other cosmetic powders.

STEEL, is the term applied to metallic iron when combined with carbon; but as

the proportion of carbon can be graded continuously from wrought-iron, which contains almost no carbon, up to cast-iron, which may contain as much as 10 per cent, the position of steel lying between these is necessarily indefinite. Besides the essential elements of iron and carbon steel may also contain small quantities of silicon, phosphorus, manganese, and sulphur. In steel used for ordinary purposes the carbon amounts from about 0.5 to 1.5 per cent; the toughness, tenacity, and hardness being increased with the increase of the carbon, while the elasticity decreases with the increase of hardness. In a red-hot condition steel can be welded almost as easily as bar-iron. It is a bright grayish white in color, the texture is granular, and in specific gravity it varies from 7.62 to 7.81. In commerce it takes various names: as when it is called blister-steel from its surface acquiring that character in the process of cementation, shear-steel when blister-steel is rolled or beaten into bars, and cast-steel when



Edward Clarence Stearns

it is melted or cast into ingots. Natural or German steel is an inferior steel procured from cast-iron or obtained at once from the ore. When it is produced from cast-iron in the refining-house it is called furnace steel, and when it has undergone the refining process only once it is known as rough steel. The value of steel depends greatly on the readiness with which it can be tempered. It is found that the higher the temperature to which steel is raised and the more sudden the cooling the greater is the hardness; hence any degree of hardness can be given to steel by applying the necessary conditions of heat and cold. The color of steel varies according to the degree of hardness to which it is tempered, and these colors at one time served to guide the workmen in tempering, but now a thermometer, with a bath of mercury or oil is used. In producing steel various methods have been employed in order

to obtain (either by extraction or addition) a metal with the required amount of carbon. Among these may be mentioned (1) The direct reduction of iron ores. In this process the iron ore is mixed with charcoal and heated until metallic iron is produced, after which more charcoal is added and the material further heated until steel is produced. The disadvantage of this process is that it yields an irregular mixture of steel and iron. (2) The adding of carbon to malleable iron. In this process, which is usually called cementation, the bars of iron are placed in fire-brick chambers between layers of charcoal and there subjected to heat from a furnace underneath. The fire is usually maintained for six or eight days, and the degree of heat to which it is raised depends upon the degree of carbonization required. When the bars, now become steel by the addition of carbon, are withdrawn they are brittle and covered with blisters. (3) The Bessemer process. In this method, which was adopted by Mr. Bessemer in 1856, the carbon is first removed from the pig-iron by blowing a stream of compressed air through the metal when in a molten condition. When this is accomplished the exact amount of carbon required is afterward added in the form of spiegeleisen, or some other variety of iron rich in carbon. Briefly, the process is conducted as follows:—The charge of molten pig-iron is run from the furnace into the converter. This latter is a vessel shaped like a bottle with the neck slightly bent sideways, formed of boiler-plate, and lined internally with a compact kind of sandstone called "ganister." The converter is then swung back into a vertical position, and in doing this the air-blast is automatically turned on. In a few minutes the carbon is all blown out of the metal, the blast is shut off, a quantity of molten spiegeleisen is run in, and then the whole contents of the converter is poured out into the casting ladle. (4) In the Heaton process the object desired is to oxidize the sulphur and phosphorus found in cast-iron and remove them in the slag. To produce this result nitrate of soda is placed at the bottom of an iron vessel and covered with a perforated iron plate. When the molten cast-iron is run in the iron plate becomes melted, and the chemical action set up by the nitrate of soda underneath destroys the silicon and removes a large part of the phosphorus. (5) In the Siemens-Martin process it is sought to decarbonize pig-iron by mixing it with malleable iron. Thus the pig-iron is run off into a furnace heated to a very high temperature by gas from a Siemens' regenerative gas furnace. Then molten wrought-iron in small quantities is added until the decarbonization of the pig-iron is complete. When this is accomplished a fresh quantity of pig-iron is added to supply the exact amount of carbon required. The whole mass is then heated for a short time until ready to be run off into ingot moulds. In the more modern "Siemens" process a much larger relative quantity of pig-iron is employed, and although scrap-iron is generally worked in the process can be completed without it. (6) In the "basic"

process, known also as the Thomas-Gilchrist process, it is sought to remove the phosphorus from such highly phosphoretic ores as those found in the Cleveland district. To effect this the ordinary Bessemer converter is lined with a mixture of magnesian lime, silica, alumina, and oxide of iron, a quantity of the latter being also added to the charge when the blast is in progress. This lining supplies a base, in combination with which the phosphorus in the molten metal becomes oxidized and converted into phosphates. As a result of the many improved methods of manufacture the cost of steel has been considerably reduced, and it is now rapidly displacing wrought-iron in almost all the uses to which it was applied. Its employment in the making of various kinds of instruments, edge-tools, springs, etc., is well known, but it is now extensively used in the manufacture of plates and rails, and is rapidly superseding iron in the building of ships and in the tall buildings in the larger cities, called sky scrapers, it has entirely replaced all other materials.

STEEL ENGRAVING. See Engraving.

STEELTON, a town in Dauphin co., Pa., on the Susquehanna river, the Pennsylvania canal, and the Penn. and the Phila. and Reading railways; 3 miles e of Harrisburg, the state capital. It contains the great plant of the Pennsylvania Steel Company, comprising blast furnaces, rail and blooming mills, and bridge and construction works. Pop. 14,186.

STEERING APPARATUS, the contrivance by which a vessel is steered, usually composed of three parts, viz.: the rudder, the tiller, and the wheel, except in small vessels, where the wheel is unnecessary. The rudder or helm is a long and flat piece or frame suspended edgewise down the hind part of a ship's stern-post, where it turns upon a kind of hinge to the right or left, serving to direct the course of a vessel, as the tail of a fish guides the body. The tiller is a bar of timber or iron, fixed horizontally to the upper end of the rudder and projecting within the vessel. The movements of the tiller are effected in small vessels by hand, assisted by a sort of tackle called the tiller-rope. In larger vessels there are properly speaking two ropes, or more commonly chains, which being wound about the axis or barrel of a wheel, act upon the tiller with the powers of a windlass. In the enormous modern vessels a ponderous system of braces and tackle became necessary to assist the working of the wheel. This was remedied by the introduction of hydraulic or steam-steering apparatus, which is a device interposed between the tiller-wheel and the rudder-head. There are numerous forms of apparatus, and by many mechanical improvements in steering machinery, manual labor at the wheel is now reduced to a minimum.

STEIN (stIn), Heinrich Friedrich Karl, Baron von, German statesman, born at Nassau 1757, died 1831. He became president of the provincial chambers of Westphalia in 1796, and a minister of state in 1804. For the severity of his criticisms on the administration he was

dismissed (1807), but was recalled, with power to introduce his reforms. Accordingly he abolished serfage by edict, made military service obligatory on all classes, and rearranged the financial administrative affairs. By means of these reforms he laid the basis of Prussia's future greatness. He afterward visited St. Petersburg, and was instrumental in bringing about the coalition which crushed Napoleon.

STEINBOCK (stin'bok), *Steenbok* (stân'bok), a small antelope found in South Africa. It is ashen gray on the sides, white underneath, stands about 2 feet in height, and its flesh is much esteemed. The male alone has short horns. The name is also applied in Europe to the ibex.

STEM, in botany, the axis of growth of a plant above ground. The stem may be either herbaceous or woody, solid or hollow, jointed or unjointed, branched or simple, upright or trailing, etc. In some plants the stem is so short as to seem to be wanting, the leaves and flower-stalks appearing to spring from the top of the root. There are also stems, such as the rhizome and tuber, which, being subterranean, have been mistaken for roots. See Botany.

STENOGRAPHY. See Shorthand.

STEPHEN, St., there are three saints of this name in the calendar, viz.: (1) The martyr whose death is recorded in the Acts of the Apostles, chapters vi. and vii., and whose festival is held on December 26; (2) Stephen, a pope from 253 to 257 (his day is the 2d of August); and (3) Stephen the king (Stephen I. of Hungary), a popular saint in Hungary and South Germany.

STEPHENS, Alexander H., American statesman, was born near Crawfordsville, Ga., in 1812. In 1834 he was admitted to the bar; was elected to the Georgia legislature in 1836 and to congress in 1843, where he at once assumed prominence, as a fearless advocate of the Union. In 1850 he opposed the secession movement. Mr. Stephens in 1860 made a great Union speech, and in 1861 became vice-president of the southern confederacy—both times on principle. In 1866 he delivered a strong reconstruction speech and plea for the new freedmen. From 1874 to 1882 he was a member of congress; in the latter year elected governor to Georgia. He died in 1883.

STEPHENSON (stē'vn-sun), George, engineer, was born at Wylam, near Newcastle, in 1781, and died in 1848. In his fourteenth year he became assistant to his father, who was fireman at a colliery, and in 1812 he was appointed to manage the engine at Killingworth colliery. Meanwhile he had been educating himself, chiefly in the science of mechanics, with the result that he obtained permission from Lord Ravensworth to construct a traveling engine for the colliery tramway. This he accomplished in 1814, and next year he introduced a great improvement in the shape of the steam-blast. In 1822 he succeeded in inducing the projectors of the Stockton and Darlington railway to adopt an improved locomotive. He was then employed to construct the Liverpool and Manchester railway, the

directors of which accepted his locomotive called the Rocket, which at the trial trip in 1830 ran 29 miles in an hour. He was afterward identified with numerous railway undertakings, and he was also the inventor of a miner's safety-lamp.—Robert, his son, born in 1803, died 1859. He was educated at Newcastle; apprenticed to a coal-viewer at Killingworth, and attended the science



George Stephenson.

classes in Edinburgh university. Afterward he assisted his father in the survey of various railway lines; and was subsequently employed in railway undertakings both at home and abroad. His most notable engineering achievements were the construction of the high-level bridge at Newcastle-on-Tyne, the railway bridge at Berwick-on-Tweed, the tubular bridge over the Menai straits, and the Victoria tubular bridge over the St. Lawrence in Canada.

STEPPEs, a Russian name applied to those extensive plains which, with the occasional occurrence of low ranges of hills, stretch from the Dnieper across the southeast of European Russia, round the shores of the Caspian and Aral seas, between the Altai and Ural chains, and occupy a considerable part of Siberia. In spring they are covered with verdure, but for most of the year they are dry and barren.

STERCULIA'CEÆ, a natural order of polypetalous exogens, allied to Malvaceæ. The plants of this order are trees



Sterculia chicha.

or shrubs, with alternate, stipulate, simple, and often toothed leaves, with a variable inflorescence. They are natives of tropical and sub-tropical regions. The most important member

of the order is the cacao-tree; others are the kola tree, the baobab, the durian, and the silk-cotton tree. The species here illustrated, a native of South and Central America, yields edible seeds as large as a pigeon's egg.

STEREOSCOPE, an optical apparatus which enables us to look at one and the same time upon two photographic pictures nearly the same, but taken under a small difference of angular view, each eye looking upon one picture only; and thus, as in ordinary vision, two images are conveyed to the brain which unite into one, the objects being thus represented under a high degree of relief. A reflecting form of stereoscope was invented by Wheatstone in 1833. Subsequently Brewster invented the refracting stereoscope, based on the refractive properties of the halves of double-convex lenses. This is the one now in general use. There are many forms of it, but it is generally a kind of small box furnished with two tubes containing each the half of a lens through which the eyes look upon the two pictures at the back of the box. When the tubes are adjusted to suit the eye the observer takes the one picture into the right eye and the other into the left eye, but the perceptive faculty apprehends only one image, and that in bold substantial relief and intensity.

STEREOTYPING, the art of reproducing a form of type in one solid plate. The first stereotyping printing in our country was done in 1775 by Benjamin Mecom, nephew of Dr. Franklin, of Philadelphia. He cast a number of pages of the New Testament. In 1829 a Frenchman, named Gerroux, made plates with the use of a long-fibered paper. This was called the papier-mâché process, and as it was much cheaper and more rapid it came into general use. It is to the invention of this process that we owe, indirectly, the rapid newspaper printing presses of today. After a form has been locked up, it is sent to the foundry, where it is brushed clean with a soft brush dipped in oil. Several sheets of damp paper pasted together are then placed on top of the type and beaten into it with a stiff brush. It is then covered with a blanket and placed in a steam-heated press, like a letter-copying press. Here under pressure, the paper is dried out until it becomes hard. It is then removed from the form, placed in a casting box and the metal poured onto the paper matrix. When the metal is cool it is taken out and finished. In a newspaper office, the casting box is circular in form and corresponds with the diameter of the cylinder of the press upon which the stereotype, when finished, is fastened. The work is done with such rapidity that it is not uncommon to place a plate upon the press in five minutes after the form has been locked up. If the paper matrix has not been torn it can be used a number of times. Stereotypes have been largely superseded by electrotypes, which see.

STERNE, Laurence, an English humorist, was born at Clonmel, Ireland, in 1713; died in London in 1768. In 1759 appeared the two first volumes of his longest work, *The Life and Opinions*

of Tristram Shandy, which, by their humor, whimsicality, and happy audacity of tone and treatment, gained instant popularity. His other writings are *A Sentimental Journey through France and Italy* (1768), and a number of sermons, besides letters published after his death. Though disfigured by indecency Sterne's *Tristram Shandy* and *Sentimental Journey*, especially the former, contain some of the finest humor in English literature.

STETHOSCOPE, an instrument used by medical men for distinguishing sounds within the thorax and other cavities of the body. In its simplest form it consists of a hollow wooden cylinder with one extremity funnel-shaped, the other with a comparatively large circular ivory plate. In using it the funnel-shaped extremity is placed upon the body of the patient, and the ivory plate to the ear of the listener, this broad plate helping to exclude foreign sounds. Flexible instruments of rubber are also used, one of these having two tubes attached to the piece which receives the sounds, these being thus conveyed to both ears simultaneously.

STETTIN', capital of Pomerania and the chief seaport in Prussia, situated on the Oder 17 miles from its entrance into the Stettiner Haff, 30 miles from the Baltic sea, and about 90 miles by rail from Berlin. Pop. 210,680.

STEUBEN (stü'ben), Friedrich Wilhelm von, Baron, German-American soldier, was born at Magdeburg, Prussia in 1730. He fought in the Seven Years' war, at the close of which he was appointed grand marshal of the Prince of Hohenzollern-Hechingen. In 1777 he came to America and immediately offered his services as a volunteer to congress. In May, 1778, he was appointed instructor-general of the Continental army. He reorganized the army introducing order and system, and enormously increased the general efficiency of the army. In 1780 he prepared a manual for the army entitled *Regulations for the Order and Discipline of the Troops of the United States*, which came into general use. After the war he received grants of land from several states, and congress voted him a pension of \$2,400. He died in 1794.

STEUBENVILLE, a city in Ohio, on the west bank of the Ohio river, 68 miles below Pittsburg. It has woolen factories, blast-furnaces, rolling-mills, machine-shops, breweries, and there are rich mines of bituminous coal in the neighborhood. Pop. 15,944.

STEVENS, Edwin Augustus, American inventor, was born at Hoboken, N. J., in 1795. He invented the "air-tight fire room" and its application to vessels, and devoted years to the study of plans formulated with a view to perfect improvements in naval warfare. The *Naugatuck*, one of the first ships to attack the *Merrimac*, was presented to the government by Mr. Stevens; the Stevens battery he donated to New Jersey, and directed in his will that a fund of \$1,000,000 should be set apart for its completion. He also founded the Stevens institute at Hoboken, and provided liberally for its support. His death occurred in Paris, France, August, 1868.

STEVENS POINT, the county seat of Portage county, Wis., 150 miles northwest of Milwaukee, on the Wisconsin river, and on the Wisconsin Central railroad. Pop. 11,575.

STEVENS, Thaddeus, American statesman, was born at Danville, Vt., in 1792. In 1814 he removed to Pennsylvania. In 1833 he became a member of the state legislature. In 1836 he was a delegate to the state constitutional convention. In 1849 he was elected to the United States congress. In 1859 he was again elected to congress, and from then until his death was the recognized leader of the house of representatives. He died in 1868.

STEVENSON, Adlai E., American statesman, was born in 1835 in Christian co., Ky. In 1874 and 1878 he was elected member of congress from Illinois by the democratic party. In 1885 he was appointed first assistant postmaster general, and in 1892 was elected vice-president of the United States. He was nominated for vice-president in 1900 by the democrats, but was defeated.

STEVENSON, Robert Louis, was born at Edinburgh in 1845; educated in the university there; was called to the Scottish bar, but devoted himself to literature, and latterly took up his residence in Samoa, where he died in 1894. His works include: *An Inland Voyage*, *Travels with a Donkey in the Cevennes*, *Virginibus Puerisque*, *New Arabian Knights*, *Treasure Island*, *Dr. Jekyll and Mr. Hyde*, *Prince Otto*, *Kidnapped*, *The Black Arrow*, *The Master of Ballantrae*, *David Balfour*, *Catriona*, *Weir of Hermiston* (left incomplete), *St. Ives*, *The Merry Men and Other Tales*, a *Child's Garden of Verses*, besides poems.

STEWART, Alexander Turney, Irish-American merchant, was born at Lisburn, near Belfast, Ireland, in 1803. In 1823 he emigrated to America, settling in New York City, and in 1825 he established himself in the dry-goods business. In 1848 he built the largest dry-goods store in the world. At the time of his death the business of A. T. Stewart & Co. comprised branches and agencies in the principal cities of Europe, and several mills and factories in the United States. He died in 1876.

STICKING PLASTER. See Court-Plaster.

STIGMA, in botany, the upper extremity of the style, and the part which in impregnation receives the pollen.



Section of flower. s, Stigma.

It is composed of cellular tissue, has its surface destitute of true epidermis, and is usually moist. In many plants there is only one stigma, while in others there are two, three, five, or many, the number of stigmas being determined by that of the styles.

STILL. See Distillation.

STILL WATER, the county seat of Washington co., Minn., 18 miles north-

east of St. Paul; on the St. Croix river and lake, and on the Chicago, Milwaukee and St. Paul, the Chicago, St. Paul, Minneapolis and Omaha, and the Northern Pacific railroads. Pop. 14,715.

STILT-BIRD, Stilt-plover, a wading bird, having remarkably long slender legs, a feature from which it derives its common name. The stilt-bird of Great



Stilt-plover.

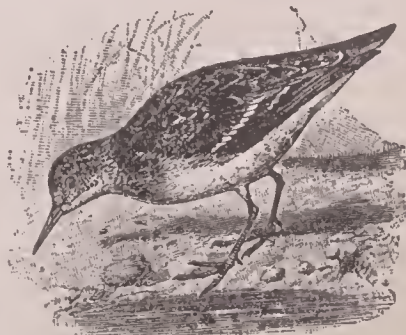
Britain has a long straight bill, very long wings for its size, and the legs, which are of a red color, measure from 18 to 20 inches.

STIMULANTS, in medicine, agents which produce a quickly diffused and transient increase of vital energy in the organism or some part of it. Stimulants are of two classes: the one comprises certain medicinal substances; the other warmth, cold, electricity, galvanism and mental agents such as music, joy, hope, etc. In the first class ammonia, alcohol, and sulphuric ether are commonly employed as stimulants. Stimulants have also been divided into general and topical, according as they affect the whole system or a particular part.

STING, a sharp-pointed weapon or instrument with which certain insects, bees and wasps in particular, are armed by nature for their defense. In most instances this instrument is a tube, through which a poisonous matter is discharged, which inflames the flesh, and in some instances proves fatal to life.

STING-RAY, a fish which is allied to that of the rays proper. It is remarkable for its long, flexible, whip-like tail, which is armed with a projecting bony spine, very sharp at the point, and furnished along both edges with sharp cutting teeth. One species is common on the eastern coasts of North America. These fishes sometimes inflict serious wounds with their tail.

STINT, a grallatorial bird, a species of



American least stint.

sandpiper. Temminck's stint is the smallest species of the British sand-

STIPULE

pipers, length $5\frac{1}{2}$ inches. It inhabits the edges of lakes and inland rivers, and is said to breed in North Europe.

STIP'ULE, in botany, a small leaf-like appendage to a leaf, commonly situated at the base of the petiole in pairs, one on each side, and either adhering to it or standing separate. They are usually of a more delicate texture



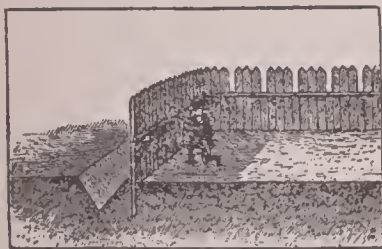
ss, Leaf with stipules.

than the leaf, but vary in this respect as well as in form and color. They are not found in all plants, but where they occur they frequently characterize a whole family, as in Leguminosæ, Rosaceæ, Malvaceæ, etc.

STIRLING, a royal and parliamentary burgh of Scotland, capital of the county of the same name, situated on a height overlooking the winding course of the river Forth, and 36 miles n.w. from Edinburgh. Pop. 18,403.—The county of Stirling consists of a main portion and two detached areas included in Perthshire and Clackmannanshire; greatest length about 46 miles; greatest breadth about 20 miles; area, 286,338 acres. Pop. 142,291.

STOAT. See Ermine.

STOCKADE', in fortification, a fence or barrier constructed by planting upright in the ground trunks of trees or



Stockade.

rough piles of timber so as to inclose an area which is to be defended.

STOCKHOLM, the capital of Sweden, beautifully and picturesquely situated between Lake Mälär and the Baltic, 330 miles northeast of Copenhagen. The chief public building is the royal palace, a fine edifice in the Italian style, other noteworthy edifices are the National library, National museum, Academy of Arts and Sciences, parliament-house, etc. The educational institutions include a medical college, a technological institute, navigation school, school of design, etc. It is besides a place of considerable trade, and has manufactures of woolen, linen, cotton, silk, porcelain, glass, tobacco, iron castings, etc. Stockholm was founded about 1260. Pop. 302,462.

STOCK-JOBING, the practice of dealing in stocks or shares, especially

by persons who buy and sell on the stock exchange on their own account and not for clients, as do the stock-brokers properly so-called. The transactions carried out are often entirely of a gambling nature, and the jobber may neither have stock of his own to buy nor to sell. This business is now carried on to an amazing extent, and is of this character: A. agrees to sell B. \$50,000 of bank stock, for instance, to be transferred in twenty days, for \$60,500. Now if the price of bank stock on the day appointed for transfer should be only \$118 per cent, he may then purchase as much as will enable him to fulfil his bargain for \$59,000, and thereby gain \$1500 by the transaction. Should the price of bank stock, however, advance to \$125 per cent, he will have to pay \$62,500 for the necessary amount of stock and will thus lose \$2,000 by completing his agreement. In effect, the stock is usually never transferred; the difference between the price of the stock on the day of delivery and the price bargained for being simply paid to one or other of the parties to the bargain. See Bulls and Bears.

STOCKPORT, a parl., mun., and county borough of England, partly in Cheshire and partly in Lancashire, 5 miles southeast of Manchester, on the Mersey. Pop. 92,832.

STOCKS, an apparatus formerly used for the punishment of petty offenders, as vagrants, trespassers, and the like.



Prisoners in the stocks.

It usually consisted of a frame of timber with holes in which the ankles, and sometimes both the ankles and wrists, of the offenders were confined.

STOCKTON, Frank Richard, American author, born at Philadelphia, 1834; attained much popularity by his short stories, which are very numerous, among the best known being the Rudder Grange stories, The Lady or the Tiger? The Ting-a-ling Stories, etc. He also wrote several novels, and stories for children. He died in 1902.

STODDARD, Richard Henry, American poet, critic, and journalist, was born at Hingham, Mass., in 1825. Among his numerous publications are: the juvenile Adventures in Fairyland, Songs of Summer, The King's Bell, a poem; Abraham Lincoln, a commemoration ode; The Lion's Cub and Other Poems, and Under the Evening Lamp. Stoddard also edited several anthologies, among them Melodies and Madrigals, Poets and Poetry of America, and Female Poets of America. He died in 1903.

STOICS, a sect of philosophers which flourished first in Greece and subse-

quently in Rome, so called from the porch or Stoa, at Athens, where Zeno, its founder, taught. It was about B.C. 308, fourteen years after the death of Aristotle and thirty-nine years after the death of Plato, that Zeno laid the foundation of the new school. The Stoics are proverbially known for the austerity of their ethical doctrines, which, indeed, quite overshadowed all the rest of their philosophy. With Zeno and his disciples the system appears to have been an attempt to reconcile a theological pantheism and a materialist psychology with a logic which seeks the foundations of knowledge in the representations or perceptions of the senses, and a morality which claims as its first principle the absolute freedom of the human will. Transferred to the Roman world, this philosophy became a practical rule of life. To Epictetus and the Stoics of the later empire the supreme end of life, or the highest good, is virtue, that is, a life conformed to nature, the agreement of human conduct with the all-controlling law of nature, or of the human with the divine will; not contemplation, but action, is the supreme problem for man; virtue is sufficient for happiness, but happiness or pleasure should never be made the end of human endeavor. The great struggle of Stoical morality is to subdue all emotion, which in itself is contrary to nature, entirely without utility, and productive only of evil. The wise man alone attains to the complete performance of his duty; he is without passion, although not without feeling; he is not indulgent, but just toward himself and others; he alone is free, having entirely subdued his passions, which are the great barrier to liberty; he is king and lord, and is inferior in inner worth to no other rational being, not even to Zeus himself.

STOKE-UPON-TRENT, a market town and parliamentary borough of England, in Staffordshire. Its extensive manufactures of china and earthenware make it the center of the "Potteries" district. Pop. 89,023.

STOLA, a garment worn by the Roman women over the tunic. It came as low as the ankles or feet, was fastened round the body by a girdle, leaving



Roman matron attired in the stola.

broad folds above the breast, and had a flounce sewed to the bottom. It was the characteristic dress of the Roman matrons, as the toga was of the men.

STOMACH, The, the principal organ of digestion in animals, may be regarded

simply as an expanded portion of the alimentary canal. The human stomach is of an irregularly conical or pear-shaped form; it is situated in the epigastric region, lying almost transversely across the upper and left portion of the abdominal cavity, below the liver and midriff and close to the front wall of the abdomen. Its largest extremity is directed to the left, its smaller to the right. Its upper opening, where the œsophagus terminates, is called the cardiac orifice, because of its closeness to the heart; and the lower opening, where the intestine begins, the pylorus, the portion of the intestine which joins it here being the duodenum. At the entrance to the latter is a valve which prevents the contents of the intestine from regurgitating backward. The stomach is composed of four coats or layers, the outermost, or serous layer, forming part of the peritoneum or general lining membrane of the abdomen. Next is a muscular coat, then an intermediate or cellular, and lastly, an inner or mucous coat in which are the orifices of the glands for the secretion of the gastric juice. By its blood-vessels the stomach is intimately connected with the liver and spleen. Its nerves are very numerous, and come from the eighth pair and the sympathetic nerve. By these it is brought into close relationship with the heart, lungs, etc. The stomach owes its digestive powers chiefly to the gastric juice, an acid liquid containing a fermentive principle called pepsin that converts albuminous foods into peptones capable of absorption. Digestion is also aided by certain stomachic movements by which the gastric juice is mixed with the food. (See Digestion.) The stomach is subject to various diseases. Acute gastric catarrh, in which the mucous membrane becomes congested, may be constitutional; but more probably it arises from errors in diet, excess of alcohol, sudden changes of temperature, etc. In chronic gastric catarrh the congestion becomes permanent, and the symptoms are such as appear in an aggravated form of dyspepsia. Ulceration of the stomach is a disease of middle life, and seems to occur most commonly among women. The ulcer is at first limited to the inner coat of the stomach, but if not healed it will strike more deeply and probably penetrate the walls of the stomach. In a case where the stomach adheres, at the seat of the ulcer, to some other organ, actual perforation may be prevented; in which case peritonitis, which is speedily fatal, is not likely to arise. The symptoms of this disease are chiefly pain, vomiting, especially vomiting of blood, and general dyspeptic symptoms. Cancer of the stomach is not uncommon, though it seldom occurs before the age of forty. Its symptoms are not easily to be decided even by a skilful physician. In mammals there are three kinds of stomachs, simple, complex, and compound. In the simple it consists of a single cavity, as in man and the carnivora, etc. This is the most common form. The complex has two or more compartments communicating with each other, with no marked difference of structure, as in the kangaroo, squirrel,

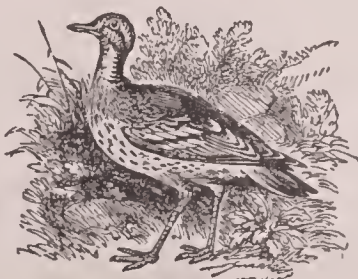
porcupine, etc. The cetacea have from five to seven such compartments. The compound stomach is peculiar to the ruminants (which see). In animals of the lowest type there is no distinct stomach cavity at all; and even in those more highly organized it is often extremely simple.

STOMACH-PUMP, a small pump or syringe used in medical practice, for the purpose of emptying the stomach and introducing cleansing or other liquids. It resembles the common syringe, except that it has two apertures near the end, instead of one, in which the valves open different ways, so as to constitute a sucking and a forcing passage. When the object is to be extracted from the stomach, the pump is worked while its sucking orifice is in connection with a flexible tube passed into the stomach; and the extracted matter escapes by the forcing orifice. When it is desired, on the contrary, to throw cleansing water or other liquid into the stomach, the tube is connected with the forcing orifice, by which the action of the pump is reversed.

STONE, a hard concretion of some species of earth, as lime, silex, clay, and the like; also, the material obtained by quarrying rocks. The principal component parts of stones are silex, alumina, zirconia, glucina, lime, and magnesia; sometimes the oxides of iron, manganese, nickel, chromium, and copper are also found to enter into their composition. Stones are of various degrees of hardness and weight; they are brittle and fusible, but not malleable, ductile, or soluble in water. Stones are of extensive use for a great variety of purposes—for building, paving, grinding, ornamental purposes, etc. The stones of public buildings are liable to decay from chemical decomposition and mechanical disintegration. To prevent this decay oils and cements have been frequently used, but they have been found to discolor the stone and require frequent renewal. A siliceous coating applied to the stone seems to be the most effectual remedy. Frederick Ransome has patented a process in which a solution of silicate of soda is first put upon the stone and afterward a solution of chloride of calcium. This process has been received with considerable favor.

STONE, a common measure of weight. The English imperial standard stone is 14 lbs. avoirdupois, but other values are in regular use, varying with the article weighed; thus, the stone of butcher's meat or fish is 8 lbs., of cheese 16 lbs., of hemp 32 lbs., of glass 5 lbs.

STONE, or **CALCULUS**. See Calculus.



Stone-plover.

STONE-PLOVER, a large species of plover. It appears in England at the

latter end of April, frequents open hilly situations; makes no nest, but lays two eggs on the bare ground, and emigrates in small flocks about the end of September.

STONES, Precious. See Gems.

STONEWARE. See Pottery.

STORK, a name given to tall and stately birds, the beak being moderately cleft and destitute of a nasal furrow. The common stork is pure white, with the exception of the black quill feathers of the wings, the scapularies, and greater wing-coverts, and the red beak, legs, and toes. It is about 3 feet 6 inches in length, and when erect its head is about 4 feet from the ground. It is remarkable for its affection toward its young.

STORM. See Meteorology, Cyclone, Wind.

STORM-GLASS, a weather-glass consisting of a tube containing a chemical solution sensible to atmospheric changes. In fine weather the substances in solution are said to settle at the bottom of the tube, leaving the liquid comparatively clear; previous to a storm the substances rise, and the liquid assumes a turbid and flocculent appearance.

STORM-SIGNAL, a cone and drum used at seaports and coast-guard stations to indicate the approach of a storm. The cone exhibited alone with its apex down portends a south gale; with its apex up a north gale. The cone with the apex down and the drum over it portends dangerous winds from the south; with the apex up and the drum under dangerous winds from the north. See Weather and Storm Signals.

STORY, Joseph, LL.D., American lawyer, born 1779, died 1845. In 1808 he entered congress, in 1810 became speaker of the Massachusetts state legislature, and soon after was appointed a judge of the United States supreme court. In 1829 he became professor of law at Harvard, a position which he held for the rest of his life. His law works include a number of special treatises, commentaries, and judgments, and a collection of his miscellaneous writings was published in 1852.

STORY, William Wetmore, American sculptor, was born at Salem, Mass., in 1819. In 1848 he went to Italy, where he made his home, residing principally at Rome, and died at Vallombrosa. The list of his works as a sculptor includes monuments, statues, ideal figures, and portrait busts. In the Metropolitan museum, New York City, are the statues of Cleopatra and Semiramis; other works by him include a statue of Edward Everett, a statue of George Peabody, erected in London, and the monument of Francis Scott Keys in the Golden Gate Park, San Francisco. His published works are *The American Question*, *Roba di Roma*, *Proportions of the Human Figure*, *Graffiti d'Italia*, five volumes of his poems, and the *Life and Letters of Joseph Story*. He was United States commissioner on fine arts to the World's Fair at Paris (1879), and received decorations from France and Italy. He died in 1895.—His son, Julian Story, a portrait painter, received a gold medal in Berlin in 1891, was elected a member of the Society of American Artists in 1892, and won a silver medal

at the Paris exposition of 1900, and was made a chevalier L^gion d'Honneur. Among his sitters were King Edward VII. and Emma Eames, the singer whom he married.

STOVE, an apparatus of metal, brick, or earthenware, which is heated within by a fire, generally almost excluded from sight. The heating medium may be burning wood, coal, petroleum, or gas. The simplest of all forms is the familiar Dutch stove, a hollow cylinder of iron, standing on the floor, close at top, whence a small flue or chimney proceeds, with bottom bars on which the coals, etc., rest. But as this form was found objectionable from the metal becoming overheated and the air in the apartment becoming unwholesomely dry, many kinds of improved stoves have now taken its place.

STOWE (stō), Mrs. Harriet Elizabeth, (Beecher) was born at Litchfield, Connecticut, in 1812. She wrote several tales and sketches, and contributed to the *National Era*, a newspaper published at Washington, the serial story of *Uncle Tom's Cabin*; issued this tale in book-



Stowe

form in 1852, when it achieved an enormous success both in the United States and Europe. Among her other numerous writings are: *Sunny Memories of Foreign Lands*, *Dred*, a Tale of the Dismal Swamp, *The Minister's Wooing*, and *Lady Byron Vindicated*. She died in 1896.

STRABISMUS. See Squinting.

STRABO, Greek geographer, a native of Amasia, in Pontus, was born about 54 B.C., and died about 21 A.D. His earliest writings were his *Historical Memoirs* and a *Continuation of Polybius*, both of whom are now lost. His great work, however, on geography, in seventeen books, has been preserved entire, with the exception of the seventh book, of which there is only an epitome. The first two books are introductory, the next ten treat of Europe, the four following of Asia, and the last of Africa.

STRADIVARI, Antonio (Stradivarius), a celebrated violin-maker, who was born in Cremona, Italy, about 1649; died 1737. He was a pupil of Nicolo Amati, in whose employment he remained until 1700, when he began making on his own account. It was he who settled the typical pattern of the Cre-

mona violin, and his instruments, for tone and finish, have never yet been excelled.

STRAFFORD, Thomas Wentworth, Earl of, an English statesman, was born in London in 1593. He sat in parliament for Yorkshire for a number of years, and when Charles I. asserted that the Commons enjoyed no rights but by royal permission, he was strongly opposed by Sir Thomas Wentworth. Archbishop Laud sent him, in 1832, to Ireland as lord-deputy. Here he greatly improved the state of the country, both as regarded law, revenue, and trade; but to accomplish his ends he did not scruple to use the strongest and most arbitrary measures. For these services he was created Earl of Strafford. When the Long Parliament met the very first movement of the party opposed to arbitrary power was to impeach Strafford of high treason. The king endeavored to secure his safety, but yielded to the advice of his counsellors, backed by a letter from Strafford himself, who urged him, for his own safety, to ratify the bill. Strafford was accordingly beheaded on Tower Hill in May, 1641.

STRAITS SETTLEMENTS, a British crown colony, deriving its name from the straits which separate the Malay peninsula from Sumatra. It consists of the island of Singapore (the seat of government); the town and province of Malacca; the island of Penang and province of Wellesley; the islands and territory of the Dindings; the Cocos or Keeling Islands as a dependency; and it has an administrative control of the native states of Perak, Selangor, Sungei Ujong, Negri Sembalan, Johore, and Pahang; area, about 35,000 sq. miles. Pop. 572,249; Feudatory states, 676,138. See Singapore, Penang, Malacca, etc.

STRANGULATION, a sudden and violent compression of the windpipe, constriction being applied directly to the neck, either around it (as in hanging) or in the forepart, so as to prevent the passage of air, and thereby suspend respiration and life. If animation is only suspended by strangulation, the methods of restoring it are much the same as in drowning.

STRASBURG, or **STRASSBURG**, a town and fortress of Germany, in Alsace, capital of the territory of Alsace-Lorraine, on the Ill, about 2 miles west of the Rhine, to which its glacis extends 250 miles east by south of Paris, and about 370 miles southwest of Berlin. By means of canals which unite the Ill with the Rhine, Rhone, and Marne, it is brought into communication with the Atlantic and the Mediterranean. The chief building is the cathedral, a structure which presents the architectural styles of the centuries from the 11th to the 15th, in which it was built, but whose main element is Gothic. The other notable buildings are the church of St. Thomas, the Temple-Neuf or Neukirche, the old episcopal palace, the town-house, the new university building, opened in 1884, and the new imperial palace. The old episcopal palace contains the university and town library numbering 600,000 volumes. Pop. 150,268.

STRATEGY may be defined as the art

of moving troops so as to be enabled either to dispense with a battle, or to deliver one with the greatest advantage and with the most decisive results. Tactics is the art of handling troops when in actual contact with the enemy.

STRATFORD-UPON-AVON, a municipal borough and market-town of England, in Warwickshire, 100 miles by rail from London, famous as the birthplace of Shakespeare. The chief objects of interest are the house in which Shakespeare was born, and the parish church in which he was buried. Shakespeare's remains were interred in the chancel, and against the north wall are his monument and bust. There are several other churches, a town-hall, guild-hall, Shakespeare memorial theater library, and picture-gallery. Pop. 8310.

STRATUM, in geology, a layer of any deposited substance, as sand, clay, limestone, etc., which has been originally spread out over a certain surface by the action of water, or in some cases by wind, especially such a layer when forming one of a number superposed and forming a mass of rock. When strata do not lie horizontally but are inclined, they are said to dip toward some point



Unconformable strata.

of the compass, and the angle they make with the horizon is called the angle of dip or inclination. When strata protrude above the surface, or appear uncovered, they are said to crop out. They are said to be conformable when their planes are parallel, whatever their dip may be; and unconformable when there is a want of parallelism between the strata. See Geology.

STRATUS. See Cloud.

STRAUS (strous), Oscar Solomon; American diplomat, was born at Atterberg, in Rhenish Bavaria in 1850. He came to the United States in 1854, and lived in Georgia until the close of the civil war. In 1887-89 he was minister to Turkey, and was reappointed by President McKinley, remaining there till 1900. On January, 14, 1902, he was named a member of the Permanent Court of Arbitration at The Hague to fill the place left vacant by the death of ex-President Harrison. In 1907 he entered the cabinet of President Roosevelt as secretary of commerce. His published works include: *The Origin of the Republican Form of Government in the United States*, *Roger Williams, the Pioneer of Religious Liberty*, *The Development of Religious Liberty in the United States*, and *Reform in the Consular Service*.

STRAUSS (strous), David Friedrich, was born at Ludwigsburg, Württemberg, in 1808, and died 1874. He went to

Berlin in 1831 to study under Schleiermacher and Hegel; returned to Tübingen and lectured on logic and philosophy and published in 1835 his famous *Life of Jesus*, in which he attempted to prove that the gospel narratives had a mythical origin and growth. His subsequent writings were: *Christliche Glaubenslehre*, *Life of Schubert*, *Life of Christian Märklin*, *Life of Ulrich von Hutten*, *Leben Jesu für das Deutsche Volk* (*Life of Jesus for the German People*), *Der Christus des Glaubens und der Jesus der Geschichte* (*The Christ of Faith and the Jesus of History*), and *De ralte und der neue Glaube* (*The Old and the New Faith*), in which he defines his final attitude to Christianity, that being now entirely hostile. His more important works have been translated into English.

STRAUSS, Johann, German composer, born 1625. He has written over 400 waltzes, many of them world-famous, the best known being *The Beautiful Blue Danube Waltz*, and is the author of several successful operettas. He died in 1899.

STRAWBERRY, a well-known fruit and plant. It is remarkable for the manner in which the receptacle, commonly called the fruit, increases and becomes succulent; but the true fruit is the small seeds or achenes on the surface of the receptacle. The species are perennial plants throwing out runners which take root and produce new plants; they are natives of temperate and cold climates in Europe, America, and Asia. Strawberries are much valued for dessert, and for purposes of jam-making. The strawberry thrives in any good garden soil, and is propagated by seeds, by division of the plant, and by runners.

STRAWBERRY-PEAR, a plant of the cactus family, which grows in the West



Strawberry-pear.

India islands. Its fruit is sweetish, slightly acid, pleasant, and cooling.

STRAWBERRY-TOMATO, the name of a plant of the genus *Physalis*, nat. order Solanaceæ, known also as winter-cherry, cultivated for its fruit, which is of a bright red color, of the size of a small cherry, and makes a delicate sweetmeat.

STRAW PLAIT, straw plaited or braided into strips or tissues of some size for making hats, bags, ornaments, etc. In the manufacture of straw hats the straw must be of a certain length between the knots and must not be brittle; and these qualities are found

most frequently in the wheat grown in Tuscany, where the well-known Leghorn hats are made. When the grain is still green the straw is pulled up by the roots, dried in the sun, bleached by means of sulphureous fumes, split by a machine, and then plaited into hats.

STREATOR, (strē'tor), a city in La Salle co., Ill., 94 miles southwest of Chicago; on the Vermilion river, and on the Chicago, Burlington and Quincy, the Chicago and Alton, the Wabash, the Indiana, Illinois, and Iowa, and the Atchison, Topeka and Santa Fe railroads. Pop. 16,800.

STREETS, Pavement of. See Pavement.

STRENGTH OF MATERIALS. The strength of any material is the resistance which it opposes to alteration of form or to fracture by an application of force. Materials are subject to many forms of strains, and some are better qualified to resist strains of a certain kind than others. Stone, for example, is admirably constituted for supporting immense weights, but it would not offer much resistance to a direct pull. Wrought-iron is superior to cast-iron in resisting a pull or tensile stress, but the latter excels the former in its resistance to a thrust or compressive stress. A material is exposed to five distinct strains; a tensile or stretching strain in the direction of its fibers, as in the case of ropes, tie-beams, etc.; a transverse strain acting perpendicularly or obliquely to its length, as in levers, joists, etc.; a crushing strain by pressure, as in the case of pillars, posts, etc.; a torsional or twisting strain acting in a perpendicular direction at the extremity of a lever or otherwise, as in axles, crankshafts, etc.; and a shearing force applied laterally, as in the case of a shearing-machine for cutting through iron plates and bars. Wrought-iron and steel offer the greatest resistance to tensile strains; the strength of wood in this direction varies according to its seasoning and specific gravity. The heavier the wood is, in general, the stronger it is. The transverse strength of beams is determined largely by their elasticity. This property varies greatly in different materials. Wood has a greater elastic range of action than iron or steel bars, and consequently sinks or deflects to a greater degree under a given weight. Any strain beyond the elastic limit entails fracture. Increased stiffness or transverse resistance of beams is rapidly obtained with an increase of depth of the beam. With the exception of wood, materials offer a greater resistance to a crushing force than to a tensile strain. Cast-iron is superior to wrought-iron in this respect, and is consequently much employed in the construction of girders and other supports. Torsional stress tries the solidity and tenacity of metals more than any other kind of stress. But the torsional strength of shafts increases very rapidly as the diameter is enlarged. The distribution of material in hollow forms conduces to the greatest strength and stiffness in combination with the minimum consumption of material. A familiar instance of the hollow construction is the stem of grasses, and especially

the bamboo, while another example is that of the hollow bones of animals.

STREPSIP'TERA, a small and very peculiar and anomalous order of insects. The females are wingless, and live as parasites in the abdomens of bees, wasps, and other insects. The males have the front pair of wings in the form of twisted filaments, the posterior pair are fan-shaped and membranous. The jaws are rudimentary. The heads of the



Strepsiptera.

a, *Stylops Dalii*, male insect. b, Do. magnified. c, Anterior wings. d, Double antennæ.

parasitic females protrude from between the abdominal joints of their host. The strepsiptera are viviparous, and the larvæ are little caterpillars which attach themselves to the bodies of wasps and bees. The female larvæ never leave their hosts; the male larvæ undergo their metamorphosis within the bodies of their hosts, from which in due time they emerge as perfect winged males.

STREPSIRHI'NA, one of the three chief divisions into which the order Quadrumana or monkeys is sometimes arranged, represented by such forms as the aye-aye or cheiromys of Madagascar, by the lemurs, loris, etc. See Lemur, etc.

STRESS, in mechanics, a term sometimes used as equivalent to strain, at other times used as the force producing strain, the latter referring to the amount of change produced. See strain.

STRICKLAND, Agnes, an English authoress, born 1796 at Reydon Hall, near Southwold, Suffolk. She wrote, in conjunction with her sister Elizabeth, *Lives of the Queens of England* (twelve vols., 1840-48); *Lives of the Queens of Scotland* (eight vols., 1850-59). She also published *Letters of Mary Queen of Scots*, with an Historical Introduction and Notes; *Lives of the Bachelor Kings of England*; *Lives of the Tudor Princesses*; poems, stories, etc. She died in 1874.

STRICTURE, a contraction of a tube, duct, or orifice; for instance, of any part of the alimentary canal or of the urinary passages. This disease usually affects the urethra and is treated by dieting and dilatation of the passage by means of catheters.

STRIKES AND LOCKOUTS, when employees cease to work to enforce a demand upon an employer it is called a strike. When the employer shuts down his establishment to compel his men to comply with a demand it is called a lockout. The first recorded strike in the United States is that of journeymen bakers of New York in 1741. The first of the great historic strikes occurred in 1877, when the employees of the Baltimore & Ohio railroad at Martinsburg refused to accept a reduction of 10 per cent in wages. In this strike not only

the state militia, but the United States troops, were called out to quell riots and disturbances. Another great strike was the one on the Pennsylvania railroad, which broke out at Pittsburgh on June 27, 1877. Still another notable strike was that of the telegraphers, which occurred in 1883. This took place to secure the abolition of Sunday work without extra pay, and the "equalization of pay between the sexes for the same work." The strike lasted from

any recognition of the miners' right to interfere with their business. When the price of coal became excessive because of its scarcity, President Roosevelt persuaded both sides to agree to arbitration by a board appointed by him. This commission increased the wages of the miners 10 per cent, denouncing boycotting and blacklisting. It estimated the loss due to the strike was: To mine owners, \$46,100,000; to employees, \$25,000,000; to transportation companies,

sympathizing unions. In the lockouts instituted by the employers a still greater per capita loss came to the employees. The individual cost to the employee was \$97, with \$4,915 cost to each establishment imposing the lockout. The strike loss to each establishment under strike duress was only \$2,194 in the twenty years. The greatest single year of loss to employees and employers was in 1894, when the sum totals were respectively \$37,145,532 and \$18,982,129. Considering the strike and the lockout as the force measures of the two sides to labor troubles, it is a toss up as to which is the more successfully carried to a finish. The percentage of success and failure is shown in the preceding tabulations:

These trades and industries involved in greatest numbers are as follows.

	Strikes	Lockouts
Building trades.....	4,440	95
Coal and coke workers.....	2,515	45
Metals and metal goods.....	2,080	130
Clothing.....	1,638	100
Tobacco.....	1,509	124
Transportation.....	1,265	23
Stone quarrying and cutting....	856	43
Boots and Shoes.....	862	59
Printing and publishing.....	765	88
Machines and machinery.....	453	25

A tabulation of the causes for strikes in the order of their number is:

Increase of wages.....	33,731
Increased wages and reduced hours.....	13,201
Reduced hours.....	13,116
Against wage reduction.....	8,423
Sympathetic strikes.....	4,078
Against employment of non-union men..	2,751
New rules and scales.....	2,742
Recognition of union.....	1,649
Increased wages and recognition of unions.....	1,111
Enforcing union rules.....	1,068
For reinstatement of discharged employees.....	868
Adoption of union scale.....	928
Against task system.....	917
Against reduction of wages and overtime.....	750
Increase of wages and Saturday half holiday.....	729

It requires twice as much time to prepare for a general strike as that general strike will last. A strike lasts 23.8 days; preparation for the strike of any magnitude will require sixty days before it is in effect.

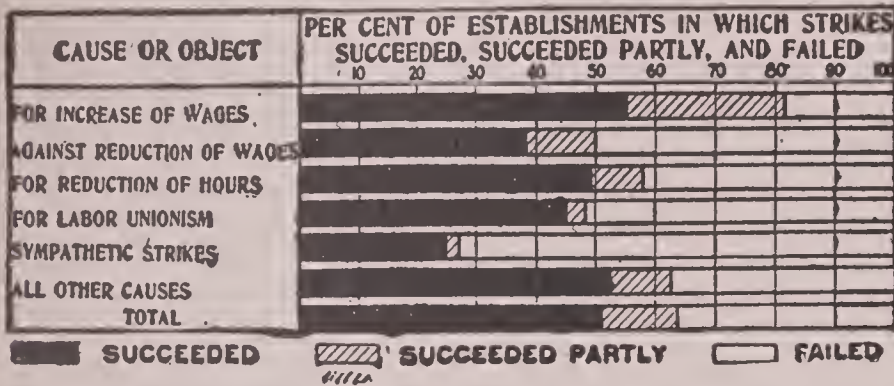
STROMBUS, the name given by Linnaeus to a genus of gasteropodous shells, now broken up into several genera. The aperture is much dilated, the lip expanding and produced into a groove.



Winged strombus.

In some of the shells of this genus there are spines of great length arranged round the circumference of the base, being at first tubular, and afterward solid, according to the period of growth.

STROPHE, the name of one of the divisions of a Greek choral ode, corresponding to the antistrōphē. The

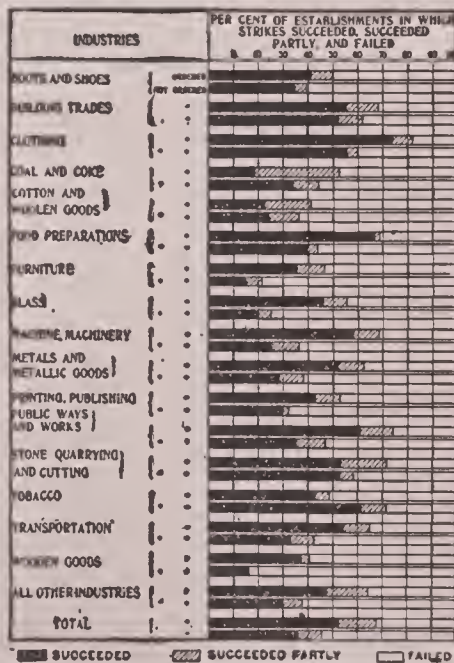


Results of strikes undertaken for five leading causes in twenty years.

July 19 to August 23, and was unsuccessful, the loss to employees being about \$250,000, while they expended about \$62,000 assisting destitute operators. The strikes on the Gould system in 1885 and 1886, and the Homestead strike in 1892 were important uprisings, the latter being considered the bitterest labor war ever waged in this country up to that time. It was the first labor disturbance in which Pinkerton detectives played an important part. These men were particularly objectionable to the strikers who stoned them, resisted their approach with firearms, and sprayed the boats in which they came with petroleum, intending to burn the detectives out. The Chicago strike of 1894 grew out of a demand of some Pullman employees for restoration of wages paid the previous year, but the company refused to pay the old wages on account of a reduction in the volume of business. Out of this little beginning grew a strike the cost of which amounted to about \$700,000 in property destroyed and hire of United States marshals. The roads lost in earnings \$5,000,000, and the employees lost more than \$350,000. Workmen on railroads radiating from Chicago lost nearly \$1,400,000 in wages and the loss to the country at large was estimated at many millions of dollars. Riots, intimidations, assaults, murder, arson, and burglary were some of the accompaniments of the great strike, and it took 14,186 men, police and military, to restore order. The largest strike in America was that of the anthracite coal miners, which began May 12, 1902, involving 147,500 men. It was due to the refusal of the presidents and directors of the coal operating railroads to comply with the employees' demands for an increase of 20 per cent in wages to miners paid by the ton, and a reduction of the hours of a days' labor from 10 to 8 without decrease in wages. The employers contended they could not afford the demands and also opposed

\$28,000,000; total, \$99,100,000. Provision was made for arbitration. When the agreement expired March 31, 1906, the men again struck to enforce their original demands, but after being out six weeks agreed to continue the agreement until 1909. For the twenty years' period ending with the last census year, according to the United States labor

	Successful.	Partly Successful	Failed
Strikes.....	50.77	13.04	36.19
Lockouts.....	50.79	6.23	42.93



Results of strikes ordered by labor organizations and strikes not so ordered in twenty years.

bureau, the strikes of the country have cost the employee in loss of wages \$257,863,478; the unions in contributions to their fellows, \$16,174,793; the employers, \$122,731,120. Each of the 6,105,693 employees lost \$42 in wages, irrespective of the contributions of the

singing of the strophes on the stage was accompanied with a motion or turn from right to left; the singing of the anti-strophe, with a contrary motion, from the left to the right.

STRYCHNINE (stri'k'nin), an alkaloid existing in nux-vomica, St. Ignatius beans, and in various other plants of the genus of Strychnos. Strychnine may be prepared from nux-vomica by treating with rectified spirit, acetate of lead, etc., precipitating with ammonia, dissolving the precipitate with alcohol, and crystallizing. Strychnine forms colorless four-sided prisms, which are inodorous and intensely poisonous. One-eighth of a grain of strychnine is sufficient to kill a large dog: three-eighths of a grain produces violent tetanic spasms in man, while half a grain has been known to prove fatal. When taken in small doses for a long period of time the drug produces increased excitability of the nerves. Strychnine resists putrefaction, and may therefore be detected in bodies which have been buried for a long time. This alkaloid combines with acids, forming a series of well-defined salts; a series of strychnine derivatives is also known, in which the hydrogen is partly replaced by such groups as ethyl, amyl, etc.

STRYCHNOS (stri'k'nos), a genus of plants, composed of trees or shrubs which do not yield a milky juice, and have opposite, usually nerved leaves and corymbose flowers; some of the species are possessed of tendrils, and are climbing plants. They are found principally in the tropical parts of Asia and America. Among the species are nux-vomica, poison-nut, or ratsbane, clearing-nut, St. Ignatius' bean, snakewood, woorali or poison-plant of Guiana.

STUART, Gilbert, American portrait painter, was born at Narragansett, R. I., in 1755. After several trips to England he established a studio in Philadelphia, where the first Washington portrait was painted in 1795. Stuart's portraits of Washington are the most famous of artist and sitter. Nearly forty replicas of his various Washington portraits have been traced. The list of his sitters includes the first five presidents of the United States, Edward Everett, John Jay, Jacob Astor, Judge Story, W. E. Channing, Josiah and Edmund Quincy, O. H. Perry, Jerome and Mme. Bonaparte. During his residence in England he painted King George III., also George IV. while Prince of Wales, Louis XVI. of France (at Paris), Mrs. Siddons, Sir Joshua Reynolds, Benjamin West, and a notable picture of "W. Grant Skating in Saint James Park," which made his reputation in England. He died in 1828.

STUART, James Ewell Brown, confederate officer, born in Patrick co., Va., in 1833. With the commission of second lieutenant he entered the army and fought Indians for three years. In 1861 he joined the confederate army with the rank of colonel, and served throughout the war, greatly distinguishing himself. He fought with Jackson and Lee, and won some very important battles, gaining the rank of general. With the exception of Sheridan, General Stuart was without doubt the foremost cavalry leader in either army. The boldness and

rapidity of his movements were remarkable. His death in 1864 resulted from a wound received in the battle of Yellow Tavern, Hanover co., Va.

STUCCO (stuk'kō), a fine plaster, used as a coating for walls, and to give them a finished surface. Stucco for internal decorative purposes is a composition of very fine sand, pulverized marble, and gypsum, mixed with water till it is of a proper consistency. The stucco employed for external purposes is of a coarser kind, and variously prepared, the different sorts being generally distinguished by the name of cements. Some of these take a surface and polish almost equal to that of the finest marble. The third coat of three-coat plaster is termed stucco, consisting of fine lime and sand. There is a species called bastard stucco, in which a small portion of hair is used.

STUDDING-SAILS, formerly called scudding-sails, fine-weather sails set outside the square sails. The top-mast and top-gallant studding-sails are those which are set outside the top-sails and top-gallant-sails; they have yards at the head, and are spread at the foot by booms which slide out on the extremities of the lower and top-sail yards, and their heads or yards are hoisted up to the top-sail and top-gallant-sail yard-arms. See Sail.

STURGEON, the general form of the sturgeon is elongated and rather slender, the snout long and pointed; the body is covered with numerous bony plates in longitudinal rows; the exterior portion of the head is also well mailed; the mouth placed under the snout is small and funnel-shaped, without teeth, and provided with tentacle-like filaments or barbules. The eyes and nostrils are on the side of the head. On the back is a single dorsal fin, and the tail is forked, but is heterocercal or unequally lobed, and is provided with a row of spines along its upper margin. The sturgeons are sea-fish, but ascend the larger rivers of Europe in great abundance, and are



Sturgeon.

the objects of important fisheries. The flesh of most of the species is wholesome and agreeable food; their roe is converted into caviare, and their air-bladder affords the finest isinglass. The common sturgeon is found off the British coasts, in the North sea, in the Mediterranean and in most of the large rivers of Europe. Its flesh is firm and well-flavored, somewhat resembling veal. The general body color is yellow; its length is usually 5 or 6 to 8 feet, but it may reach 12 feet. The food consists of molluscs, small crustaceans and small fishes. The great or white sturgeon, or beluga is found in the Danube, the Volga, and other rivers running into the Black and Caspian seas. It frequently exceeds 12 and 15

feet in length, and weighs above 1200 pounds. The flesh is not much esteemed, but the finest isinglass is made from its air-bladder. There are several species peculiar to North America. One of these, the fresh-water sturgeon inhabits the great lakes and connected streams.

STUTTERING. See Stammering.

STUTTGART, capital of the Kingdom of Württemberg, S. Germany, beautifully situated near the left bank of the Neckar, and closely surrounded by vineyard slopes, 816 feet above the sea. Stuttgart is the chief center in South Germany for the book trade, connected with which are paper-mills, type-foundries, printing-presses, and lithographic establishments. Pop. 176,318.

STUYVESANT (sti've-sant), Peter, born in Holland in 1602; in 1647 was made director-general of the Dutch colony of the New Netherlands, a position he held until 1664, when the colony fell into the hands of the English and became known as New York. Stuyvesant went to Holland the next year, but soon returned, and passed the rest of his life at his farm called the Bouwerij, from which the present Bowery in the city of New York has its name. He died in 1682.

STYLE, in botany the prolongation of the summit of the ovary which supports the stigma. Sometimes it is entirely wanting, and then the stigma is sessile, as in the poppy and tulip. When the ovary is composed of a single



a, Style; b, Stigma.

carpel, the style is also single, and the number of styles varies according to the number of carpels, though when the carpels are numerous the styles may be united.

STYLE, Old and New. See Calendar.

STYRIA, a duchy of Austria, bounded by Upper and Lower Austria, Hungary, Croatia, Carniola, Carinthia, and Salzburg; area, 8670 sq. miles. The whole duchy, with the exception of the southern part, is mountainous. The chief sources of wealth are the forests and minerals, dairy-farming, mining, and manufactures. Gratz is the capital. Pop. 1,356,058.

STYX, in Greek and Roman mythology, the name of a river of the infernal regions. Styx was also a rivulet in Arcadia, whose water was considered poisonous.

SUABIA, or **SWABIA**, an ancient German duchy. On the division of the kingdom of the Franks in 843, Suabia, along with Bavaria, became as it were the nucleus of Germany, and its rulers continued for many centuries to hold a prominent place in its history. The name of Suabia is given to a division of Bavaria; area, 3730 sq. miles; pop. 650,166. Augsburg is its capital.

SUBJECT. See Object.

SUBLIMATE, Corrosive. See Corrosive Sublimate.

SUBLIMATION, a process by which solid substances are, by the aid of heat, converted into vapor, which is again condensed into the solid state by the application of cold. Sublimation bears the same relation to a solid that distillation does to a liquid. Both processes purify the substances to which they are severally applied, by separating them from the fixed and grosser matters with which they are connected. The vapor of some substances which undergo the process of sublimation condenses in the form of a fine powder called flowers; such are the flowers of sulphur, flowers of benzoin, and others of the same kind.

attainment of her object. In all the cases above mentioned we are moved by a vivid feeling of some greater power than our own, or some will more capable of suffering, more vast in its strength, than our feeble vacillating will.

SUBLIME PORTE. See Porte.

SUBMARINE BOAT, a boat that travels completely or partly under the surface of the water. There are two types—the submerged and the submergible. Submerged boats are nearly cylindrical with pointed ends, the shape being like a Whitehead torpedo. To effect submergence water is admitted to the ballast tanks or it is effected by means of inclined rudders. Submergible boats have two hulls, one inside the

SUBMARINE CABLE, a rope of wires and insulating materials laid along the bed of a sea or ocean through which telegraphic messages are transmitted. The conducting portion of such cables consists of a number of pure copper wires twisted into a strand which is covered with alternate coatings of a pitchy mixture and gutta-percha. This core is then covered with Manila yarn and twisted iron wires. The first attempt to lay a submarine cable was made in 1850 between Dover and Calais, but the cable only lasted a few hours owing to friction against the rocks. However, electric communication across the channel was re-established not long after. The first Atlantic cable, from Ireland to Newfoundland, was successfully laid by the Great Eastern in 1866, after unsuccessful attempts in 1857, 1858 and 1865. The work of laying the first Pacific cable began in 1902. Signals through the cables are generally recorded by Thomson's mirror galvanometer and also by his siphon recorder, which enables the transmission of messages to be carried on with great rapidity. See Telegraph, Electric.

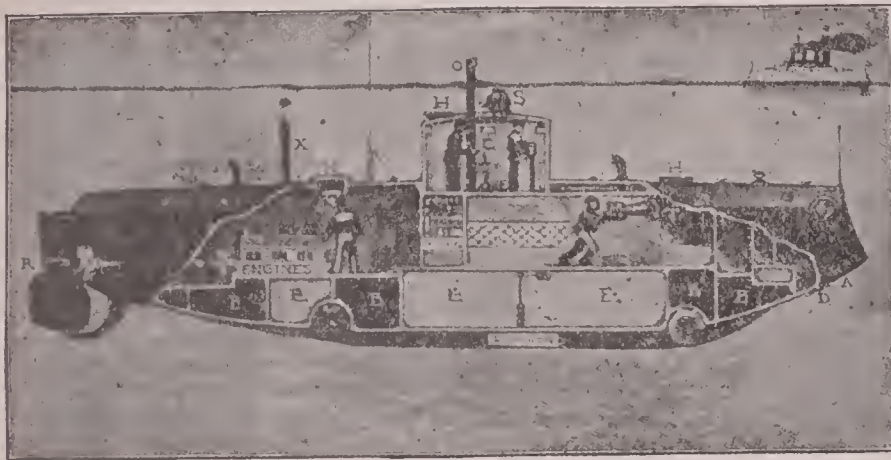
SUBORNATION OF PERJURY, the crime of inducing a person to commit perjury; punishable similarly to perjury. See Perjury.

SUBPOENA, in law, is a writ commanding a witness to appear in court. When he is required to bring books or papers in his possession, a clause is inserted to that effect, and the writ is then called a subpoena duces tecum ("bring with you under penalty"). A witness is allowed his traveling expenses.

SUBSIDY, a term now used to denote the pecuniary assistance afforded, according to treaty, by one government to another, sometimes to secure its neutrality, but more frequently in consideration of its furnishing a certain number of troops. Subsidy was formerly an aid or tax granted to the crown for the urgent occasions of the kingdom, and was levied on every subject according to the value of his lands or goods.

SUBSTANCE, in a philosophical sense, is contradistinguished from accident, and signifies that which exists independently and unchangeably; while accident denotes the changeable phenomena in substance, whether these phenomena are necessary or casual, in which latter case they are called accidents in a narrower sense. Substance is, with respect to the mind, a merely logical distinction from its attributes. We can never imagine it, but we are compelled to assume it. We cannot conceive substance shorn of its attributes, because those attributes are the sole staple of our conceptions; but we must assume that substance is something different from its attributes. Substance is the unknown, unknowable substratum on which rests all that we experience of the external world.

SUBWAYS, tunnels cut or built for various purposes beneath the streets of large cities. Tunnels for sewer, gas and water pipes, telegraph and telephone wires increase the life and general serviceability of pavements, prevent interruption to traffic, facilitate inspection and repair, and lessen the number of troublesome and dangerous leaks from



Submarine torpedo boat.

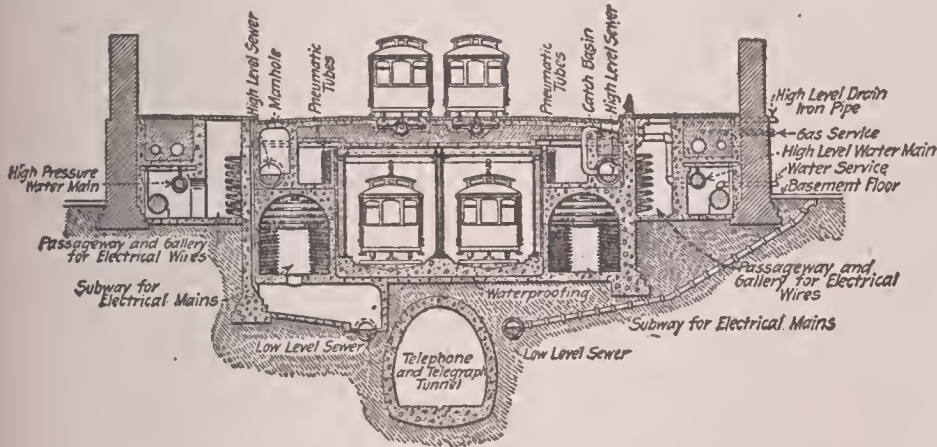
Other sublimates require to be in a solid and compact form, as camphor, hydrochlorate of ammonia, and all the sublimates of mercury. The substance formed by the process of sublimation is called a sublimate.

SUBLIME, The. This term is applied both to that quality of objects which produce a mingled feeling of pleasure and awe and to the emotion itself. The invariable condition of the sublime in objects, either material or moral, is vastness, power, or intensity. The invariable condition of the emotion of sublimity—that which distinguishes this emotion from every other emotion—is a comprehension of this vastness or power, with a simultaneous feeling of our own comparative insignificance. The antithesis to the emotion of sublimity is the emotion of contempt. In every case of sublimity in material objects, whatever feelings may simultaneously concur, vastness will be found to be an invariable condition—vastness either of form or of power, as in the violent dashing of a cataract, in the roar of the ocean, in the violence of the storm, in the majestic quiet of Mont Blanc, preserving its calm amid all the storms that play around it. In the moral world the invariable condition of sublimity is intensity. Mere intensity is sufficient to produce the sublime. Lear, who appeals to the heavens, "for they are old like him," is sublime from the very intensity of his sufferings and his passions. Lady Macbeth is sublime from the intensity of her will, which crushes every feminine feeling for the

other. To effect submergence water is first admitted to the space between the hulls, and this brings the boat to the "awash" condition. Further submergence is effected by permitting the ballast tanks to fill. The record of attempts to perfect submarine vessels begins with the seventeenth century, since which time the problem has well nigh constantly enlisted inventive skill. Almost every year since 1850 has witnessed some new design or practical experiment. The first real success was made by the American Engineer, David Bushnell, in 1775. Robert Fulton built a boat (1795-1812) in which on one occasion he was submerged for five hours. In recent times many national governments have experimented with various types of the submarine. The United States has had them under consideration for many years. In 1892 an appropriation of \$200,000 was made to permit the navy department to build and test a submarine. The plans of I. P. Holland were selected. The first Holland boat, the beginning of the really successful submarine was built in 1875. After severe test the tenth type of the Holland boat was ordered in 1900. This boat can dive like a duck, and on the surface it makes about 10 miles an hour. It carries three torpedo tubes and uses the largest size of Whitehead torpedoes. In 1903 eight submarines were put in commission. The results arrived at during the Russian-Japanese war will greatly influence the views held as to the military value of submarine craft and the methods of their construction.

SUCCESSION WARS

water and gas mains. The concentration of population in cities has made it necessary to solve suitable and economic means of transportation, etc. The first city to feel the need of subways was London. In 1853 a two track underground road was begun. From the beginning two lines, the Metropolitan railway and the Metropolitan District railway, were produced. The routes, however, were not properly selected, and they were not successful. In 1886 the first practical tubular railroad was started. It was designed to be operated with cables but before its completion electricity was substituted. The most approved form of subway was introduced at Budapest in 1893. It is constructed with a flat roof, consisting of steel beams with arches turned between them, permitting the whole structure to be brought close to the surface of the street, obviating the use of mechanical means of taking the passengers from platform to street level. In the meanwhile lines had been projected in New York and Boston, the first work



Cross-section of the Chicago subway.

on subways being begun in the latter city. The subway planned in Boston was partly a two track and partly a four track structure. The subway has been connected with both the surface and elevated systems. The work of building the subway in New York did not begin until 1900. The general type of this subway is of the flat roof shallow form, bringing the rail and platform level as close to the surface of the street as possible. The topography of the city, however, has compelled a departure from this type in several instances so that a portion of the road is deep tunnel and the portion beneath the East river and the approaches thereto of the tubular type. The cost of constructing subways is very great. The New York subway being the largest and most complete as yet constructed, has cost \$47,000,000, being an average exclusive of equipment of more than \$2,000,000 per mile.

SUCCESSION WARS, wars which have arisen from claims for the possession of the crown on the occasion of a sovereign dying without undisputed legal heirs. In modern European history the most important of these struggles were those of the Spanish succession (1700-13), and of the Austrian succession (1740-48). See Spain and Austria.

SUCKER, or **SUCKING-FISH**, a name applied popularly to the Remora (which see).

SUCKLING, Sir John, a wit, courtier, and dramatist, born in 1609, at Whitton, in Middlesex. Being implicated in a plot to rescue the Earl of Strafford from the Tower he was obliged to flee to France, where he is said to have committed suicide about 1641. His writings consist of letters, miscellaneous poems, including ballads and songs, and several plays, which were probably the first plays produced with stage scenery on an elaborate scale.

SUDERMANN (zoo'der-män), Hermann, German dramatist and novelist, born at Matzicken, East Prussia, in 1857. He won European fame and assured literary position by a drama *Die Ehre*, and the novel *Dame Care*. He followed these up with the novel *Regina*; the stories *Im Zwielficht*, the humorous novel *Iolantes Hochzeit*, and his greatest drama, *Magda*, a fine novel of moral psychology, *Es war, Das Glück im Winkel* and *Johannes*, a real-

istic dramatic presentation of the story of John the Baptist; *The Joy of Living*, etc.

SUE (sü), Marie-Joseph-Eugène, French novelist, born at Paris in 1804. On his father's death in 1829 he inherited an immense fortune, and devoted himself to literary composition. His first work was a sea novel entitled *Kernock le Pirate*, which was quickly followed by *Plick et Plock*, *Atar-Gull*, *La Salamandre*, and *La Vigie de Koatven*. But his most famous works are *The Mysteries of Paris* and *The Wandering Jew*. His later novels are *L'Enfant Trouvé*, *Les Sept Péchés Capitaux*, and *Les Mystères du Peuple*. In 1850 he was elected to the Constituent assembly, and sat as an advanced radical. After the coup d'état by Napoleon III. in 1851, he left France and retired to Annecy, where he died in 1857.

SUEABORG. See Sweaborg.

SUET, the fatty tissue situated about the loins and kidneys of certain domestic animals, especially the ox and sheep and which is harder and less fusible than the fat from other parts of the same animals. Beef-suet is much used for culinary purposes, and purified mutton-suet forms an ingredient in ointments, cerates, and plasters.

SU'EZ, a town of Egypt, situated at

SUFFOLK

the Red sea, terminus of the Suez canal, 76 miles e. of Cairo, with which it is connected by rail. Pop. 10,919.

SUEZ CANAL, the great ship-canal without locks connecting the Mediterranean with the Red sea; running from Port Said on the former to Suez on the latter, a distance of nearly 100 miles. According to Herodotus a large canal from the Red sea to the Nile was constructed about 6000 B.C. This canal, which seems never to have been of much use, was finally blocked up about 767 A.D. Napoleon I. had conceived the idea of making a ship-canal across the isthmus of Suez. In 1854 the French engineer M. Ferdinand de Lesseps obtained a concession for that purpose, and in 1858 was able to form a company for carrying on the work. Operations were begun on the 25th April, 1859, and on the 17th November, 1869, the canal was opened; the total cost of construction was nearly \$80,000,000. There were 75 miles of



actual excavation, the remaining 25 miles being through shallow lakes which had to be deepened. A canal was also constructed for bringing fresh water from the Nile at a point near Cairo. This canal reaches the salt-water canal at Ismailia, and then runs almost parallel to the ship-canal to Suez. It is almost 40 feet wide and 9 deep, and is used for navigation as well as for domestic purposes and irrigation. The land on both sides of the ship-canal is to be retained by the company for ninety-nine years. In November 1875 the British government bought from the Viceroy of Egypt his interest in the canal, consisting of 176,602 shares, for the sum of \$20,000,000. The distance between London and Bombay by the old route round the Cape is about 11,220 miles; by the canal route, 6332. Steam-ships are allowed to sail at a speed of five to six knots an hour along the canal.

SUFFOLK (suf'ok; literally south-folk), a maritime county of England, bounded by the German ocean, Essex, Norfolk, and Cambridgeshire. It has a coast-line of about 50 miles, and an area of 1500 sq. miles, or 944,060 acres. Pop. 384,198.

SUFFRAGAN. See Bishop.

SUFFRAGE, the right to vote for any purpose, but more especially the right of a person to vote in the election of his political representative. Many writers advocate the universal extension of this right, but in most countries it is limited by a household or other qualification. It is generally held by leading politicians that the extension of the suffrage should proceed gradually with the advance of education.

SUGAR, a name applied to various compounds of carbon, hydrogen, and oxygen, all of which have a more or less sweet taste, a neutral reaction to vegetable colors, and are soluble in water. The sugars are generally of vegetable origin; they are mostly crystallizable, and when in solution they rotate the plane of a ray of polarized light. Among all these compounds the sugar of the sugar-cane and beet is distinguished par excellence by the name sugar. It is supposed that sugar was first cultivated in India, but a knowledge of the sugar-cane and its method of cultivation was brought from Persia by the Arabs, and given by them to Europe. The Spaniards were the first to plant it in Maderia (1490), from whence it spread to their possessions in the West Indies and South America; while during the middle ages Venice was the emporium of the trade in sugar. There is a record that so early as 1319 it was shipped from the latter port to London. It was, however, chiefly used as medicine until the beginning of the 19th century, when it became a food staple in connection with tea and coffee. Sugar is principally prepared from the sugar-cane and from beet. (See Sugar-cane and Beet.) The first operation in the manufacture of sugar from sugar-cane consists in pressing the juice from the canes. For this purpose the canes are passed under large rollers, which extract about 70 to 90 per cent of the juice. The cane-juice is now boiled in copper vessels; milk of lime, sulphurous acid, or phosphoric acid is added to neutralize the vegetable acids (malic, etc.), and at length the sugar crystallizes. The liquid portion remaining is drained off and sold as molasses. In obtaining the juice from beet-root two methods have been adopted. In one of these the roots are placed in a cylinder, where they are mashed to a pulp by rows of saw-toothed blades driven with great rapidity, after which the juice is pressed out by means of a hydraulic press; in the other process the roots are placed in a series of cylinders through which water is forced until the saccharine matter in the roots has all been obtained. By this process as much as 90 per cent of the juice is extracted. When this is accomplished the expressed juice is heated to about 70° C., milk of lime is added, and the temperature increased; the lime separates the impurities in the form of phosphates and albuminates of calcium, etc., which cover the surface with a white crust. When the boiling juice breaks through the crust the liquid is run off and cleared of the lime by carbonic acid. The syrup is then twice filtered, and allowed to crystallize. The sugar-cane contains about 18 per cent, and the beet

11.2 per cent of sugar. The first process of refinement is to dissolve the raw sugar in water to which a little lime is added; this solution is heated by steam and passed through filters, generally consisting of deep vats, the bottoms of which are perforated and covered with a thick layer of animal charcoal. The syrup is then collected underneath and boiled down to induce crystallization. The latter operation is conducted in vacuum-pans connected with an air-pipe, a condenser, and a pipe to admit steam. The juice being in the pan, a partial vacuum is produced by means of the air-pump, and steam circulates through a coiled pipe in the pan until the liquid boils, while the vapor thereby produced is removed and condensed. The sugar-syrup is then run out and allowed to crystallize in conical-shaped vessels of clay or sheet-iron; papier-mâché is also used. In these vessels the crystalline mass assumes its marketable form, from which it derives the name of loaf-sugar. After draining the sugar in the moulds the juice is completely removed by a centrifugal machine; the sugar-loaf is then dried. From the syrup which drains off an inferior sugar is obtained, and the remaining uncrystallized syrup is sold as molasses. Sugar-candy is prepared by boiling sugar-syrup with a little animal charcoal, clearing with white of egg, boiling down over an open fire, and crystalizing. Sugar-candy is known in commerce as refined-white, which forms large colorless crystals, and is prepared from refined cane-sugar; yellow-candy, forming straw-colored crystals, prepared from boiled sugar; and brown-candy, similar in color to ordinary moist sugar, and prepared from inferior cane-sugar. Sugar candy is largely used for making liquors, sweetening champagne, etc. Sugar is also produced extensively in North America from the rock or sugar maple, in Asia from various species of palms, and in various countries from species of Guinea-corn or sorghum. The common sugars have the general name of cane-sugar. Another form of sugar, called grape-sugar is the type of sugars called glucoses, and is manufactured chiefly for the use of brewers and wine-makers; it is also known as honey-sugar, fruit-sugar, starch-sugar, etc. It occurs in many natural fruits, such as the peach, plum, current, apple, and grape, in quantities varying from 1.5 per cent. in the peach to 15 per cent in the grape. It also forms the solid crystalline portion of honey. Grape-sugar may be obtained from grape-juice by heating it with marble, filtering, clearing with ox-blood, evaporating, and crystalizing. It is, however, generally prepared by boiling starch with dilute sulphuric acid; the clear liquid is then run off from the precipitate, evaporated by steam, filtered through animal charcoal, and run into the crystalizing vessels. Dextrose or grape-sugar as well as cane-sugar belongs to the class of fermentable sugars. A certain number of other sugars, as mannite or manna-sugar, quercite or oak-sugar, etc., are non-fermentable. Cane-sugar crystalizes in large monoclinic prisms, which when broken exhibit phosphorescence. At

160° it melts to a clear liquid, which when cool and solidified is commonly known as barley-sugar. The quantity of cane-sugar in a solution which contains no other substance may be estimated by simply estimating the specific gravity of the solution, but when other bodies are present it must be ascertained by other chemical processes or by means of the saccharometer, which is an instrument for determining the rotatory power exercised by a solution of sugar upon a ray of polarized light. Large quantities of sugar from the cane are produced in India, China, the United States, Java, Cuba, Demerara, Jamaica, and other parts of the West Indies, Brazil, etc.

SUGAR BEET, a vegetable botanically of the same species as the garden beet, and important commercially as the source of a very large part of the world's supply of sugar. The sugar beet thrives upon a rich, loamy soil in a climate having a temperature of about 70°. The sugar content and yield are influenced by many factors, and field experts are employed to instruct the farmers how to grow beets in the proper way. The average cost of growing an acre of sugar beets is about \$30. The average yield is about 12 tons, with an average sugar content of 14.5 per cent., which represents a yield of about 3900 pounds of sugar per acre.

SUGAR, BEET, the manufacture of sugar from beet roots is a modern industry. Margraff in 1747 announced to the Berlin Academy of Sciences the analyses of several sugar-containing plants and predicted that the sugar beet, being the most saccharine of the plants examined, would become the basis of a great industry. The United States department of agriculture and various experiment stations have assisted greatly in the development of the beet-sugar industry, the capital invested in 1907 being more than \$30,000,000.

SUGAR-CANE, a plant from which great part of the sugar of commerce is obtained. It is nowhere found in a wild state, but is probably a native of tropical Asia. It grows to the height of 7 or 8 feet or more, and has broad ribbed



Sugar-cane.

leaves, and smooth shining stems. It is now cultivated in all the warm parts of the globe, such as the West Indies, Brazil, Java, etc., but varies in rapidity of growth according to the situation, the season, or the weather. The sugar-

cane flowers only after the lapse of an entire year, and a plantation lasts from six to ten years. The juice of the cane is so palatable and nutritive that during the sugar harvest every creature which partakes freely of it appears to derive health and vigor from its use. For the process of making sugar, as well as for other information regarding this product, see the preceding article.

SUGAR, MAPLE, the manufacture of maple sugar is carried on more or less wherever sugar-maple trees are abundant, especially in the Northern Atlantic and Northern Central states, the leading producers being Vermont and New York. The busy period depends upon the locality and upon the season, sometimes commencing in February and sometimes lasting until the middle of May, the best flow of sap being when there is a diurnal alternation of thawing and slight freezing.

SUGAR-MITE, a species of mite frequently to be observed in raw sugar, very similar in appearance to the itch-mite.

SUGAR-OF-LEAD, the common name for acetate of lead. See Lead.

SU'IDÆ, the family of mammals of which the hog is the type. This family is characterized by having on each foot two large principal toes, shod with stout hoofs, and two short lateral toes which



Characters of suidæ.

a, Skull of wild boar. b, Teeth of upper jaw. c, Teeth of lower jaw. d, Foot. e, Bones of foot.

hardly touch the earth. The canine teeth project from the mouth and curve upward. The muzzle is terminated by a truncated snout, fitted for turning up the ground. The family includes the wild boar, the wart-hog, and the peccary.

SULLA, Lucius Cornelius, Roman dictator, was born in 138 B.C. He served with distinction under Marius in the Jugurthine (107 B.C.) and Cimbrian (104-102) wars, and in 93 was chosen prætor. For his services in the Social war (90-88) he was appointed consul (B.C. 88), and the province of Asia, with the conduct of the war against Mithridates, fell to his lot. Sulla at the head of his army drove Marius to Africa, and then sailed for Greece at the beginning of 87 B.C. He expelled the armies of Mithridates from Europe (86), crossed into Asia (84), and was everywhere victorious, gaining plenty of wealth for himself and his soldiers, and forcing Mithridates to conclude a peace. Sulla now hastened to Italy, and landed at Brundisium with 40,000 men, B.C. 83. He gained four battles over the Roman

forces in person, and defeated a Samnite army under Telesinus. He entered the city victorious in 82, and immediately put to death between 6000 and 7000 prisoners of war in the circus. Rome and all the provinces of Italy were filled with the most revolting scenes of cruelty. After satisfying his vengeance by the murder or proscription of thousands he caused himself to be named dictator for an indefinite period (B.C. 81). He now ruled without restraint, repealed and made laws, abolished the tribuneship, and settled his veterans in various parts of Italy. In 79 B.C. he laid down his dictatorship, and retiring to Puteoli abandoned himself to all sorts of debauchery. He died in 78 B.C. See Rome.

SULLIVAN, Sir Arthur Scymour, born in London 1842. He has written oratorios (*Prodigal Son*, *Light of the World*), anthems, songs, etc.; but his most popular compositions are the burlesque operettas which he has produced in conjunction with W. S. Gilbert. Among the most popular of these are *H. M. S. Pinafore*, *Pirates of Penzance*, *Patience*, *Mikado*, and *the Gondoliers*. In 1886 he set to music an arrangement of Longfellow's *Golden Legend*, which is one of his finest compositions. He was knighted in 1833. He died on Nov. 22, 1900.

SULLY, Maximilien de Béthune, Duc de, Marshal of France and first minister of Henry IV., was born in 1560. In 1597 he was appointed controller of finance, and by his excellent administration largely reduced taxation, and eventually paid off a state debt of 300,000,000 livres. In 1606 the territory of Sully-sur-Loire was elected into a duchy in his favor. After the murder of Henry IV. (1611) he retired from court and resigned most of his charges. He was created a marshal by Richelieu in 1634, and died in 1641.

SULPHATES, salts of sulphuric acid. Sulphuric acid is dibasic, forming two classes of sulphates, viz. neutral sulphates, in which the two hydrogen atoms of the acid are replaced by metal, and acid sulphates, in which one hydrogen atom only is so replaced. Of the sulphates, some are found native; some are very soluble, some sparingly soluble, and some insoluble. The most important sulphates are—sulphate of aluminium and potassium, or alum; sulphate of ammonium, employed for making carbonate of ammonia; sulphate of copper, or blue vitriol, much used as an escharotic in surgery, and also used in dyeing and for preparing certain green pigments; sulphate of iron, or green vitriol, used in making ink, and very extensively in dyeing and calico-printing; it is also much used in medicine; sulphate of calcium, or gypsum; sulphate of magnesium, or Epsom salts; sulphate of manganese, used in calico-printing; sulphate of mercury, used in the preparation of corrosive sublimate and of calomel; bisulphate of potash, much used as a flux in mineral analysis; sulphate of sodium, or Glauber's salts; sulphate of quinine, much used in medicine; sulphate of zinc, or white vitriol, used in surgery, also in the preparation of drying oils for varnishes, and in the

reserve or resist pastes of the calico-printer. Many double sulphates are known.

SULPHUR, an elementary, non-metallic, combustible substance which has been known from the earliest ages; chemical symbol, S. It frequently occurs in a pure state in beds of gypsum or clay, but is generally associated with sulphate of strontium. It also occurs in chemical combination with oxygen and various metals, forming sulphates and sulphides. It is found in greatest abundance and purity in the neighborhood of volcanoes, modern or extinct, as in Sicily; and as an article of commerce is chiefly imported from the Mediterranean. It is also found in Iceland, California, and Mexico. That which is manufactured in Britain is obtained by the roasting of iron pyrites; the condensed mass of sulphur thus obtained is broken into lumps and distilled. Native sulphur is usually separated from the earthy matter by a process of distillation, the sulphur vapors being liquefied by a condenser. The product obtained from native sulphur, or from iron pyrites, is afterward refined by a further process of distillation. Pure sulphur is commonly met with in two forms, that of a compact, brittle solid, and a fine powder. It is nearly tasteless, of a greenish-yellow color, and when rubbed or melted emits a peculiar odor. Its atomic weight is 32, and its specific gravity 1.99. It is insoluble in water, and not very readily soluble in alcohol, but is taken up by spirits of turpentine, by many oils, and by carbon disulphide. It is a non-conductor of electricity. It is readily melted and volatilized. It fuses at 232° Fahr., and between 232° and 280° it possesses the greatest degree of fluidity, and, when cast into cylindrical moulds, forms the common roll-sulphur of commerce. It possesses the peculiar property of solidifying at a higher degree, or when raised to 320°. From 480° to its boiling point (790°) it again becomes fluid, and at 792° it rises in vapor, which condenses in close vessels in the form of a fine yellow powder, called flowers of sulphur. Sulphur exists in two distinct crystalline forms, and also as an amorphous variety; these modifications are characterized by differences in specific gravity, in solubility in various liquids, and in many other points. Sulphur combines with oxygen, hydrogen, chlorine, etc., forming various important compounds; it also unites with the metals, forming sulphides. It is employed in the manufacture of gunpowder, matches, vulcanite, and sulphurous and sulphuric acids. It is also employed in medicine, and for various other purposes. Sulphur chloride is produced by passing chlorine gas into a retort containing melted sulphur. It is used for vulcanizing caoutchouc. Sulphur forms two combinations with oxygen, the dioxide and the trioxide. The former is the sole product of the combustion of sulphur; it is a colorless gas, which may be liquefied and solidified by cold and pressure. This gas is used in the arts for bleaching silk, wool, straw, parchment, and generally such substances as are destroyed by the action of chlorine. Sulphur trioxide is a white

crystalline solid, produced by the oxidation of the dioxide. Sodium thiosulphate is produced by boiling sulphur with soda lye, and passing sulphur dioxide into the solution until it is completely decolorized. It is largely used in the arts as an antichlor, and for fixing photographs. Carbon disulphide is a volatile liquid, with a poisonous vapor, produced by the action of sulphur upon carbon at high temperatures. It is used for dissolving caoutchouc and gutta-percha, for extracting essential oils, spices, etc., from plants and seeds, and bitumen from minerals, etc.

SULPHURIC ACID, or OIL OF VITRIOL, a most important acid discovered by Basil Valentine toward the close of the 15th century. It was formerly procured by the distillation of dried sulphate of iron, called green vitriol, whence the corrosive liquid which came over in the distillation, having an oily consistence, was called oil of vitriol. The principal upon which it is now manufactured was laid down by Roebuck in 1746, and consists in burning sulphur, or more frequently iron pyrites, in closed furnaces, and leading the fumes, mixed with oxides of nitrogen, into large leaden chambers, into which jets of steam are continuously sent. The oxides of nitrogen are produced by the action of sulphuric acid upon nitre contained in pots, which are placed between the sulphur ovens and the chambers. The sulphur dioxide takes away part of the oxygen from the oxides of nitrogen, which are again oxidized by the air in the chambers. The sulphur trioxide produced unites with the steam to form sulphuric acid. The acid produced in the chamber is condensed in leaden vessels until it reaches a certain gravity (about 1.72), when it is run into glass, or sometimes platinum vessels, where the condensation is continued until the specific gravity has increased to 1.84. The acid of gravity 1.72 constitutes the brown acid of commerce; it is largely used in the manufacture of superphosphate of lime and for other purposes. Pure sulphuric acid is a dense, oily, colorless fluid, exceedingly acid and corrosive, decomposing all animal and vegetable substances by the aid of heat. It unites with alkaline substances, and separates most of the other acids from their combinations with the alkalies. It has a very great affinity for water, and unites with it in every proportion, producing great heat; it attracts moisture strongly from the atmosphere, becoming rapidly weaker if exposed. The sulphuric acid of commerce is never pure, but it may be purified by distillation. With bases sulphuric acid forms salts called sulphates, some of which are neutral and others acid. By concentrating sulphuric acid as far as is possible without decomposition, and cooling the liquid so obtained, crystals of the true acid are formed. The ordinary acid is a hydrate of varying composition. A very strong form of sulphuric acid, known as Nordhausen acid, is prepared by heating green vitriol in closed vessels; it is a solution of sulphur trioxide in sulphuric acid, or it may be regarded as pyro-sulphuric acid. It has a specific gravity varying from 1.86 to

1.92, and is chiefly used in the arts for dissolving indigo. Of all the acids the sulphuric is the most extensively used in the arts, and is in fact the primary agent for obtaining almost all the others by disengaging them from their saline combinations. Its uses to the scientific chemist are innumerable. In medicine it is used in a diluted state as a refrigerant.

SULPHURIC ETHER (ethylic, vinic, or ordinary ether) is a colorless transparent liquid, of a pleasant smell and a pungent taste, extremely exhilarating, and producing a degree of intoxication when its vapor is inhaled by the nostrils. It is produced by distilling a mixture of equal weights of sulphuric acid and alcohol, and by various other means. Its specific gravity is 0.720. It is extremely volatile and highly inflammable; and its vapor, mixed with oxygen or atmospheric air, forms a very dangerous explosive mixture. It dissolves in 10 parts of water, and is miscible with alcohol and the fatty and volatile oils in all proportions. It is employed in medicine as a stimulant, and antispasmodic. Ether, by its spontaneous evaporation, produces a great degree of cold, and is used in the form of spray in minor surgical operations for freezing the part, and thus rendering it insensible to pain. True sulphuric ether, known also as sulphate of ethyl is an oily liquid of burning taste and ethereal odor, resembling that of peppermint. It is almost incapable of being distilled without decomposition, as at a temperature of about 280° it resolves itself into alcohol, sulphurous acid, and olefiant gas.

SULPHUROUS ACID. See Sulphurous Oxide.

SULPHUROUS OXIDE, a gas formed by the combustion of sulphur in air or dry oxygen. It is transparent and colorless, of a disagreeable taste, a pungent and suffocating odor, is fatal to life, and very injurious to vegetation. At 45°, under the pressure of two atmospheres, it becomes liquid, and also at 0° under the pressure of one atmosphere. It extinguishes flame, but is not itself inflammable. It has considerable bleaching properties, so that the fumes of burning sulphur are often used to whiten straw, and silk and cotton goods. The gas is also called sulphur dioxide; when led into water it forms sulphurous acid. This acid readily takes up oxygen, passing into sulphuric acid; it is dibasic, forming salts called sulphites.

SULTAN, in Arabic, signifies "mighty one, lord." It is the ordinary title of Mohammedan rulers. The ruler of Turkey assumes the title of Sultan-es-selatin, "Sultan of sultans." The title sultan is also applied to the sultan's daughters, and his mother, if living, is styled Sultan Valide.

SULTANPUR, a district of India, in Oudh; area, 1707 sq. miles. Chief river, the Gumti. Pop. 957,912.—The town Sultanpur, administrative headquarters of the district, contains the usual public buildings, and has a population of 9374.

SULU, or **SOOLOO ISLANDS**, a group in the Indian archipelago, consisting of more than 150 islands, which stretch from the n.e. point of Borneo to the

Philippine Islands; total estimated area, 1600 sq. miles. Sulu, the chief island, is lofty, and lies near the center of the group. The islands are of volcanic origin, and produce all kinds of tropical plants and trees. They are well watered, and enjoy an immunity from the hurricanes which ravage the neighboring islands. The inhabitants are of Malay descent, and nearly all profess the Mohammedan religion. There is a considerable trade between Sulu and Singapore in bêche-de-mer, pearl shells, birds'-nests, etc. The Sulu islands, with the Philippines, now belong to the United States of America. Pop. estimated at 200,000.

SUMACH (sū'mak), a genus of shrubs with pinnate leaves and small flowers. They all have a lactescent acrid juice, and most of them possess valuable tanning properties. More than seventy species are known.

SUMA'TRA, a great island in the Indian seas immediately under the equator, separated from the peninsula of Malacca by the Straits of Malacca and from Java by the Straits of Sunda. Greatest length, about 1000 miles; breadth, about 240 miles; area, about 150,000 sq. miles. Banca and other islands adjoin the coast. There are several volcanoes in the island. Copper, tin, and iron are found in abundance, and deposits of coal exist. Mangroves grow near the coast, and at higher elevations myrtles, palms, figs, and oaks of various species are met with. The camphor-tree prevails in the north, and among vegetable curiosities are the upas-tree and the gigantic Rafflesia. Pepper, rice, sugar, tobacco, indigo, cotton, coffee, are cultivated for export, and camphor, benzoin, catechu, gutta-percha and caoutchouc, teak, ebony, and sandal-wood are also exported. The island is all nominally under the authority of the Dutch, who have divided it into eight administrative divisions. Sumatra has a very mixed population, consisting of Malays, Chinese, Arabs, and many native tribes. The tidal wave accompanying the volcanic eruption of Krakatoa in 1883 caused great destruction on the south coast of Sumatra. The chief towns are Palembang and Padang. The total population is estimated at between 3,000,000 and 4,000,000.



Sumbul.

SUMBAL, or **SUMBUL**, an Eastern name for the root of an umbelliferous plant. It contains a strongly odorous

principle, like that of musk, and is regarded as an antispasmodic and stimulating tonic.

SUMBAWA, an island of the Indian archipelago, lying south by west of Celebes, between Lombok and Flores, about 160 miles long from east to west, with a breadth varying from 13 to 31 miles. The inhabitants are of Malay race and Mohammedans. Pop. about 150,000.

SUMMER, the season of the year which in the northern hemisphere generally may be said to comprise the months of June, July, and August. The astronomical summer lasts in the northern hemisphere from the June solstice to the September equinox, during which time the sun being north of the equator, shines more directly upon this part of the earth and rises much sooner and sets later, which renders this the hottest period of the year. The period of greatest heat generally takes place in August, since the influence of the sun's rays has then been felt for a long time on the earth, and the wind blowing from the north becomes milder owing to a moderation of the temperature in the polar circle caused by the thawing of the ice. In the southern hemisphere the summer lasts from the December solstice to the March equinox. See Seasons.

SUMMONS, in law, a writ addressed to the defendant in a personal action, admonishing him to appear in court. It must contain the names of all the defendants, the name and address of the person taking it out, and the date of issue; but it need not state the form or cause of action.

SUMNER, Charles, an American jurist and statesman, born at Boston, Massachusetts, in 1811. In 1836 he published three volumes of Judge Story's decisions, subsequently known as Sumner's Reports, and edited a periodical called the American Jurist. In 1851 he was elected to the senate of the United States, and distinguished himself by his strong antipathy to slavery. In May, 1856, after delivering a speech vigorously attacking the slaveholders, he was violently assaulted by P. S. Brooks, a member representing a slaveholding state (South Carolina). His injuries compelled him to absent himself from public duties for nearly four years. He was a supporter of Lincoln and Hamlin, and in 1861 he became chairman of the senate committee on foreign relations. He was an enemy to the policy of President Johnson, and opposed the home and foreign policy of President Grant. After the latter's re-election in 1872 Sumner seldom appeared in debate. He died at Washington, March 11, 1874.

SUN, the central orb of the solar system, that around which revolve the earth and the other planets. The sun appears to be a perfect sphere, with a diameter of 866,900 miles; its mean density is about $\frac{1}{4}$, taking that of the earth as 1; its mean distance from the earth is taken as 93,000,000 miles. It rotates on its own axis; this axis of rotation being inclined to the ecliptic at an angle of $82^{\circ} 40'$; and its rotation period is variously estimated at from twenty-five to twenty-eight days. The mass of

the sun is about 750 times that of all the other members of the solar system combined, and the center of gravity of the solar system lies somewhere in the sun, whatever may be the relative positions of the planets in their orbits. The sun is now generally believed to be of gaseous constitution, covered with a sort of luminous shell of cloud formed by the precipitation of the vapors which are cooled by external radiation. This



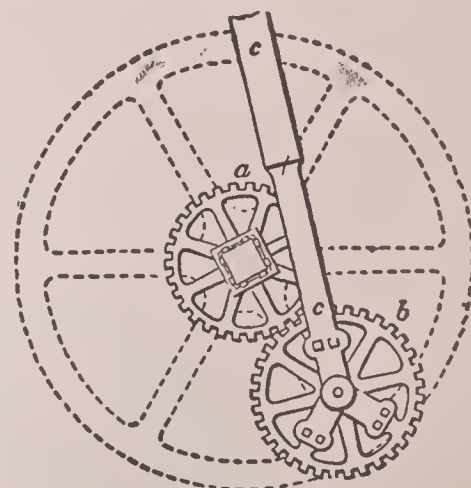
Group of sun-spots of June 5, 1864.

dazzling shell is termed the photosphere. The spots are supposed to be cavities in this cloud-layer, caused by the unequal velocities of neighboring portions of the solar atmosphere. Zöllner, who considers the body of the sun to be liquid, sees in them slags or scorix floating on a molten surface, and surrounded by clouds. It is estimated that the sun's radiation would melt a shell of ice covering its own surface to a depth of between 39 and 40 feet in one minute, but the temperature of the surface has not yet been ascertained. It is evident, however, that the temperature and radiation have remained constant for a long period. The photosphere is overlaid by an atmosphere which is shown by the spectroscope to contain nearly all the materials which enter into the composition of the sun. And in the lines of the spectrum of sunlight is found proof of the existence in the solar atmosphere of the following substances: Iron, titanium, calcium, manganese, nickel, cobalt, chromium, barium, sodium, magnesium, copper, hydrogen, zinc, sulphur, cerium, strontium, and potassium. In 1706 Captain Stannyan observed a blood-red streak just before the limb of the sun appeared after a total eclipse, and such appearances were subsequently observed, being first scientifically described in 1842 under the names of flames, protuberances, or prominences. In 1868 the spectroscope showed that these appearances were due to enormous masses of glowing hydrogen gas floating

above the sun, similarly to clouds in our atmosphere. The region outside the photosphere in which these colored prominences are observed has been called the chromosphere, which has an average depth of from 3000 to 8000 miles. The incandescent hydrogen clouds stretch out beyond this to altitudes of 20,000 to 100,000 miles, and jets of chromospheric hydrogen have been observed to reach a height of 200,000 miles in twenty minutes, and disappear altogether within half an hour. Outside the chromosphere, extending very far out from the sun, is the corona, an aurora of light observed during total eclipses, and which is now the chief object to be observed by eclipse expeditions. This phenomenon has been shown to be connected with the existence of what is called the "coronal atmosphere," but the nature of this atmosphere is as yet undetermined. The amount of light sent forth by the sun is not exactly measurable, but the amount of heat has been pretty accurately computed, and it is equivalent in mechanical effect to the action of 7000 horse-power on every square foot of the solar surface, or to the combustion on every square foot of upward of 13½ cwt. of coal per hour.

SUN, Worship of the. Sun worship probably prevailed in the earliest times among all nations, and the chief deities of the polytheisms of ancient India, Egypt, Greece, Rome, Germany (Indra, Amoun Ra, Zeus, Jupiter, Odin, etc.), are, according to a popular theory, all identified as sun gods. But by some people the sun itself was worshiped as a physical object associated with fire, as among the followers of Zoroaster, the ancient Celts, etc. Peru seems to have had the most complete system of sun worship.

SUN AND PLANET WHEELS, an ingenious contrivance adopted by Watt, in the early history of the steam-engine, for converting the reciprocating motion of the beam into a rotatory motion. In the annexed figure the sun wheel *a* is a



Sun and planet wheels.

toothed wheel fixed fast to the axis of the fly-wheel, and the planet wheel *b* is a similar wheel bolted to the lower end of the connecting-rod *c*; it is retained in its orbit by a link at the back of both wheels. By the reciprocating motion of the connecting-rod the wheel *b* is com-

pelled to circulate round the wheel a, and in so doing carries the latter along with it, communicating to the fly-wheel a velocity double its own.

SUNDAY (that is, day of the sun, like Monday, day of the moon), the first day of the week, the Lord's day. See Sabbath.

SUNDAY-SCHOOLS, schools held on Sunday for the purpose of imparting religious instruction to the young by means of reading and repetition in the Bible, catechism, hymns, etc. In 1527 Martin Luther established several Sunday-schools in Germany for the instruction of children and youths in reading the Holy Scriptures, and in the latter half of the same century Cardinal Borromeo organized similar schools throughout Milan. The modern Sunday-schools, however, as an institution, were founded in England by Robert Raikes, editor of the Gloucester Journal, in 1781, who, in order to prevent the profanation of the Sabbath by the children of the poorer classes, engaged several women to instruct such children as he should send to them on Sundays in reading and the catechism, paying each of them a shilling for her day's work. His example was soon followed by other charitable persons, and in 1785 a society was formed for the encouragement of Sunday-schools by pecuniary aid, etc. Gratuitous instruction became general about 1800, and in 1803 the first Sunday-school union was formed in London. Similar unions were quickly established in many large towns and in some of the counties. The Scottish Sabbath-schools (first established in Edinburgh in 1787) arose from the English Sunday-schools, and so universal has the establishment of Sunday-schools now become in the British Isles that one exists in connection with nearly every church. In America the first Sunday-schools were opened at New York in 1816, and have since multiplied rapidly and overspread the whole country. By 1815 such schools had been introduced into most European countries, but do not appear to flourish so well among foreign nations as in English-speaking countries. The total number of school teachers and scholars in the world according to the report of the Eleventh International Sunday School convention, held at Toronto, Canada, in 1905, was exclusive of Roman Catholics and non-Evangelical Protestant churches 262,131 schools, 2,426,888 teachers, 22,739,323 scholars. The number of scholars in Roman Catholic schools in the United States is estimated at 1,000,000. The Twelfth International Sunday School convention will be held at Louisville, Ky., in June, 1908.

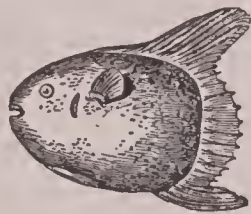
SUNDERLAND, a seaport, mun., county, and parliamentary borough of England, at the mouth of the Wear, county of Durham, 13 miles n.e. of Durham, and 12 miles s.e. of Newcastle. The staple trade interests of the place are shipping, the coal trade, and ship-building, and there are also large factories for the making of marine engines, iron work, bottles, glass, earthenware, rope, etc. Pop. 146,565.

SUN-DEW, plants growing in bogs and marshes, having leaves clothed with

reddish hairs bearing glands which exude drops of clear glutinous fluid, glittering like dew-drops, whence the name. A characteristic of these plants is their habit of capturing insects by their viscid secretion. Mr. Darwin, in his *Insectivorous Plants* (1875), says that the sun-dew derives its nitrogenous food by absorption from the tissues of insects entangled in the inflected tentacles of its viscid leaves; while like other plants it obtains and assimilates carbonic acid from the air. He further shows that these leaves have the power of digestion, and that they act on albuminous compounds in the same manner as does the gastric juice of higher animals, the digested matter being afterward absorbed. The digestive faculty has also been traced in Venus' fly-trap, butterwort, the pitcher-plant, etc.

SUN-DIAL. See Dial.

SUN-FISH, a genus of fishes. These fishes are short and almost circular in form, their jaws are undivided, and they have no swimming-bladder. The sun-fish appears like the head of a large fish separated from its body, and when swimming it turns upon itself like a wheel. It grows to a large size, often



Short sun-fish.

attaining a diameter of 4 feet, and sometimes even that of 12 feet. The skin is hard and leathery, but the flesh is soft, white, and palatable. The liver is large, and yields an oil highly valued among sailors as a cure for rheumatism. The sun-fish is found in all seas from the antarctic to the arctic circle.

SUN-FLOWER, natural order of plants, so called from the ideal resemblance of the yellow flowers to the sun with his golden rays. The root is mostly perennial; the stem herbaceous, upright, and often tall; the leaves opposite or alternate, undivided, often rigid and scabrous; the flowers large and terminal, usually disposed in a corymb. The species are numerous, and mostly inhabit North America. The gigantic sun-flower common in gardens is a native of Peru. The stem is from 6 to 15 feet in height; the flowers, sometimes 1 foot in diameter, are usually turned toward the south. The seeds form an excellent nourishment for poultry and for cage birds; and an edible oil has also been expressed from them.

SUN-SPOT, a dark patch on the sun, varying in size from a minute telescopic object to vast areas visible to the naked eye and thousands of miles in diameter. Sun-spots have an interesting history. Galileo was charged with blasphemy because he called attention to them, and Stanley Jevons, the British economist, advanced the theory that sun-spots and money-panics had some relation to each other. Certain it is that the well-known "cycle" of sun-

spots and "cycle" of panics have been, in the past at least, coincident. The regular period of sun-spots is about eleven years, that is, every eleven years the spots on the sun are abundant and in the intermediate time they decrease in number and even vanish. The same has been true of panics. The great sun-spot of March 5, 1873, was 100,000 miles across. In this terrific cavern four planets each as large as our earth could have been swallowed up. The year 1906 was a maximum year for sun-spots, but Jevons's law seemed to have failed, except in England, where, during that year, the most painful industrial depression was experienced.

The causes of these remarkable appearances on the sun's surface are not known, although it is pretty certain that they are really comparatively shallow depressions on the photosphere, the darkness being due to the absorption of light occasioned by the lower temperature within the depression. Numerous spots appear to grow and disappear, lasting from only a few hours to many months. A great group of smaller spots often coalesce and form a great spot. That they have some connection with the sun's rotation on its axis is shown by the relation of the spot zone to the equator, being most numerous in latitudes from 15 degrees to 20 degrees. It has been held that the aurora borealis, or northern lights, are caused by sun spots, and on several occasions unusual disturbances of this kind in the sun have been accompanied by startling magnetic and electric storms on the earth.

SUN-STROKE, any sudden and severe injury to the health resulting from the exposure of the head to a hot sun. The most usual symptoms of sun-stroke are the following:—Pains in the head, accompanied by fever; lethargy, or suffering which prevents sleep; congestion of the brain or other nerve-centers, or an inflammation of the brain sometimes ensues, and often terminates fatally. Sometimes the effects of the stroke can be discerned only in impaired bodily health or mental vigor dating from some occasion on which the patient was exposed to a violent sun.

SUPERFŒTATION, a second conception after a prior one, and before the birth of the first child, by which two fœtuses are growing at once in the same womb. Several certified cases have occurred in which women have given birth to two children, the second child being born at periods varying from 90 to 140 days later than the first. These certainly appear to be cases of superfœtation. The possibility of superfœtation in the human female has been vigorously opposed by some eminent physicians, and as vigorously defended by others. Some believe that up to the third month of gestation a second conception may follow the first, and that this will satisfactorily account for all the cases of superfœtation on record. It has also been argued that the human uterus may be double in some cases, and that in each of its cavities a fœtus may be contained.

SUPERIOR, a city, port of entry, and capital of Douglas co., Wis., at the head

of Lake Superior, on St. Louis, Superior, and Allouez bays, and the Gt. North., N. Pac., Chi., St. P., Minn. and Om., St. P. and Duluth, Dul. and Winnipeg, and the Dul., S. Shore and Atl. railways; opposite Duluth, Minn. It has three perfect landlocked harbors, all connected, with total length of 13 miles and width of from 1 to 3 miles. The manufactures are chiefly flour, lumber, lath, shingles, iron, chairs, barrels, bags, coke, and woolen goods. Superior was a station of the Hudson Bay company, over 200 years ago. Pop. 35,415.

SUPERIOR, Lake, the largest expanse of fresh water in the world, and the most westerly and most elevated of the North American chain of lakes. It washes the shores of the state of Minnesota on the west, those of Wisconsin and the northern peninsula of Michigan on the south, and those of Canada in all other directions. Its greatest length is 420 miles, greatest breadth 160 miles; circuit about 1750 miles; area about 32,000 sq. miles (or the same as that of Ireland). It is 630 feet above sea-level, and varies in depth from 80 to 200 fathoms. In shape it forms an irregular crescent, dotted with numerous islands toward its northern and southern sides. The northern shore consists of cliffs varying in height from 300 to 1500 feet, but the southern shore is low and sandy, although occasionally interrupted by cliffs, among which are the fantastic Pictured Rocks, 300 feet high, one of the greatest natural curiosities of the United States. The waters of the lake are remarkable for their transparency, and are well stocked with fish, principally trout, white-fish, and sturgeon. The lake receives more than 200 streams, and about thirty are of considerable size. The outlet is at the southeast by St. Mary's river. Fish and copper are the chief exports, the latter existing in valuable veins both on the shores and islands of the lake.

SUPERIOR PLANETS. See Planets.

SUPERNATURALISM, a term used chiefly in theology, in contradistinction to rationalism. In its widest extent supernaturalism is the doctrine that religion and the knowledge of God require a revelation from God. It considers the Christian religion an extraordinary phenomenon, out of the circle of natural events, and as communicating truths above the comprehension of human reason. Rationalism maintains that the Christian religion must be judged of, like other phenomena, by the only means which we have to judge with, namely reason. See Rationalism.

SUPPURATION. See Inflammation.

SURAT', a town of India, Bombay presidency, capital of a district of same name, on the left bank of the Tapti, about 20 miles above its mouth in the Gulf of Cambay. Pop. 119,306.

SUPREME COURT OF THE UNITED STATES, The, is the head of the national judiciary. The supreme court is authorized by the constitution. Section 1 of Article III. provides that "the judicial power of the United States shall be vested in one supreme court, and in such inferior courts as the congress may from time to time ordain and establish." The supreme court is a constitutional court,

while the other courts are statutory. The first act in organizing the supreme court was passed at the first session of the United States congress, approved by Washington on September 24, 1789, and directed that the court should consist of a chief justice and five associate justices, any four of whom should make a quorum. It now consists of nine members. They hold office for life. The act of September 24th not only made provision for the supreme court, but created the inferior courts of the United States and organized its entire judicial system.

SURETY. See Guarantee.

SURF-DUCK, or **SURF-SCOTER**, a species of duck, about the size of a mallard frequently seen on the coasts of Labrador, Hudson's bay, and other parts of North America.

SURGEON-FISH. See Sea-surgeon.

SURGERY, the operative branch of medicine, or that part of the medical art which is concerned with the removal of injured parts or organs, or with the healing of lesions by means of operations on the parts affected, either by the hand or with instruments. Surgery early became separated, for practical ends, from medicine, and by a natural expansion came to embrace two parts, the science pertaining to surgical operations, and the art required for conducting them. From this arose a mischievous distinction between medical and surgical cases. We have thus surgical and medical anatomy, surgical and medical pathology, and surgical and medical clinics. But the progress of science has both extended the domain of surgery, and made the relation between it and medicine more intimate. The origin of surgery may almost be held to be coeval with the human race. Herodotus says that the medical art in Egypt was divided into numerous branches representing each member of the body. The Greeks made considerable progress in surgery, and the Hippocratic collection contains six surgical treatises in which important operations are described as conducted in a mode little behind the modern practice. Medicine was first cultivated at Rome by Greek slaves. It afterward became a special science, and among its professors who advanced the art of surgery were Archagathus (200 B.C.), surnamed the executioner, from his frequent use of the knife; Asclepiades, to whom is attributed the origin of laryngotomy; and Themison, the first to use leeches. A greater name than these is that of Celsus, called the Latin Hippocrates, who flourished about the beginning of the Christian era. He mentions autoplasmic operations and the treatment of hernias, and his method of amputation is still occasionally employed. Galen (died 200 A.D.) did much for medicine but little for surgery. Paul of Aegina, a practitioner of the 7th century, may be looked upon as the last representative of the Græco-Roman school. The Arabs were initiated into medicine and surgery by the translation of the works of the Greeks. Among the Asiatic Arabs the only devoted student of surgery who has left any record of his art is Abulcasis, who flourished at the beginning of the 12th century. On the decline of the Roman empire, the medi-

cal art in Europe fell entirely into the hands of the monks, and when, in 1163, the Council of Tours prohibited the clergy from performing any operation, surgery became incorporated with the trade of barber, and was reduced to the simplest operations, chiefly that of letting blood. The earliest revival of science arose from the contact of Europeans with the Eastern nations, particularly the Arabs, and before the close of the 11th century Salerno, in Italy, acquired celebrity for a school of medicine in which all the teachers were laymen. This school acquired the right to confer the degrees of master and doctor. Among surgeons of reputation of the Salernian school, may be mentioned Roger of Parma, and his disciple Roland, who made great use of cataplasms and other emollients. Guy de Chauliac, the first great surgeon of France, belongs to the latter half of the 14th century. Berengarios de Carpi held a chair at Bologna from 1502 to 1507. He boasted of having dissected more than 100 dead bodies, and made important discoveries. Vesalius, a Belgian physician, born 1514, died 1564, is regarded as the father of modern anatomy. He prepared the way for Ambrose Paré, who did for surgery what Vesalius had done for anatomy. Paré was surgeon in ordinary to Henry II., Charles IX., and Henry III. His works were translated into English, and include a general treatise on surgery, and a special treatise on wounds. Among the great surgeons of the 16th century were Paracelsus, who advocated a thorough reform in surgery; Guillemeau, whose special study was ophthalmia; Pineau, a skilful surgeon and lithotomist; Jacques Démarque, one of the first authors who wrote on bandages; and Fabricius of Hilden in Germany, the author of a complete course of clinical surgery, and the inventor of surgical instruments for the extraction of foreign bodies from the ear, urethra, etc., which are still in use. In England Harvey, the discoverer of the circulation of the blood, lectured on surgery; but a genuine school of surgery was first founded by Richard Wiseman, who has been called the Paré of England. His works were published in two vols. in 1676. In England the Company of Barber Surgeons, incorporated by Edward IV. in 1461, gave place to a separate corporation of surgeons in 1745. In 1731 the Royal Academy of Surgery was founded in Paris, and soon produced a school of surgeons so eminent as to take the lead of their profession in Europe. The rapid advance of scientific knowledge in the 19th century has not been without its influence on the art of surgery. The 19th century will ever be conspicuous in the annals of surgery as that in which the inestimable boon of anæsthetics was conferred upon mankind, by which not only has pain in surgery been abolished, but the extent of its operative department immensely enlarged. Of no less importance has been the discovery of the relation of micro-organisms to putrefaction and to infectious diseases, and the consequent introduction of the antiseptic method of treating wounds. A scarcely less noticeable feature of this epoch has been the

application of the rules of hygiene to the construction and management of hospitals, by which the general health of the patients has been much benefited, and the mortality reduced. The operative skill of the surgeon has kept pace with the increased precision in physiological knowledge, and surgical operations are now performed on many parts of the body which not long ago would have been deemed certain death to the patient. Diseased conditions in the cranium, the thoracic cavity, the abdomen, the joints, are all successfully treated. Cancerous affections are boldly treated by excision, while diseases of the uterus are now treated with a boldness and success which a few years ago seemed impossible.

SURMULLET, a name of fishes allied to the perches, and often called red mullets. They have two dorsal fins with a wide interval between them, the first being spinous, and two long barbels hanging from the lower jaw. The common red mullet of the Mediterranean is about 12 inches long, esteemed very delicious food, and was much prized by the Romans.

SURNAMES. See Names, Personal.

SURPLICE, a white garment worn by priests, deacons, and choristers in the Church of England and the Roman Catholic church over their other dress during the performance of religious services. It is a loose, flowing vestment



Surplice, brass of Prior Nelond, Cowfold, Sussex.

of linen, reaching almost to the feet, having sleeves broad and full, and differs from the alb only in being fuller and having no girdle nor embroidery at the foot.

SURREY, a county of England, bounded by the Thames, separating it from Buckinghamshire and Middlesex; by Kent, Sussex, Hampshire, and Berkshire; area, 485,129 acres, of which more than half is under crops. Pop. 2,008,923.

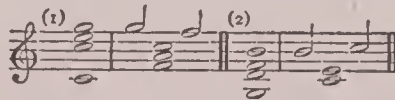
SURVEYING, the art of measuring the angular and linear distances of objects on the surface of the earth, so as to be able to delineate their several positions on paper, to ascertain the superficial area, or space between them, and to draw an accurate plan of any piece of ground in more or less detail. It is a branch of applied mathematics, and is of two kinds, land surveying and marine surveying, the former having generally

in view the measurement and delineation on paper of certain tracts of land, and the latter the laying down of the position of beacons, shoals, coasts, etc. Those extensive operations of surveying which have for their object the determination of the latitude and longitude of places, and the length of terrestrial arcs in different latitudes, are frequently called trigonometrical surveys, or geodetic operations, and the science itself geodesy. In land-surveying various instruments are used, the most indispensable of which are Gunter's chain, for taking the linear dimensions when the area of the land is required; the theodolite, for measuring angles; and the surveyor's cross, or cross-staff, for raising perpendiculars. See Geodesy, Trigonometrical Survey, and Ordnance Survey.

SURVIVAL OF THE FITTEST. See Natural Selection.

SUSA, an ancient city of Persia. It was a very extensive city, with a strongly fortified citadel, containing the palace and treasury of the Persian kings, whose chief residence it was from the time of Darius I. It is the Shushan of the book of Daniel, where it is mentioned as situated on the banks of the river Ulai or Eulæus. The plain of Susa is covered with extensive mounds, in which fragments of brick and pottery with cuneiform inscriptions are found, and important discoveries have been made.

SUSPENSION, in music, the prolongation of a note in a chord, having the effect of suspending for a moment cer-



Suspension (1) from above; (2) from below.

tain notes in the following chord; or the delay of a dissonance in reaching the chord into which it is to be resolved.

SUSPENSION-BRIDGE. See Bridge.

SUSQUEHAN'NA, a river of the United States, formed by two branches an eastern or northern branch, 250 miles long from Lake Otsego in New York, and a western branch, 200 miles from the western slope of the Alleghanies, which unite at Northumberland in Pennsylvania. The united stream flows south and southeast, and after a course of 150 miles reaches the head of Chesapeake bay at Port Deposit, Maryland. It is a wide but shallow stream, nowhere navigable to any extent, save in the spring.

SUSSEX, a southern maritime county of England, bounded north by Surrey, north and northeast by Kent, southeast and south by the English Channel, and west and northwest by Hants; area, 933,269 acres, of which more than two-thirds is under crops. Pop. 605,052.

SUTHERLAND, a maritime county in the north of Scotland, bounded north and west by the Atlantic, south by Ross and Cromarty, east by the North sea and Caithness; area, 1,297,846 acres, of which about one-thirtieth part is under crops. Pop. 21,550.

SU'TRAS, in Sanskrit literature, the name given to the numerous series of religious aphorisms and rules, including

all the ritual, grammatical, metrical, and philosophical works, and consisting of brief sentences to be committed to memory. These were usually written on dried palm-leaves tied together by a string.

SUTTEE' (Sanskrit, sati, an excellent wife), a term applied by the English to the self-immolation of Indian widows on the funeral pile of their deceased husbands. The origin of this practice is of considerable antiquity, but it is not enjoined by the laws of Manu, nor is it based on the Vedas. It was abolished by Lord Bentinck, governor-general of India, in December, 1829, but cases are still occasionally heard of.

SU'TURE, in anatomy, is the line of union of two bones between which there is no motion, as the bones of the skull.

SUZERAIN, in feudalism, a lord paramount; the king, for instance, in relation to his immediate vassals, or these as grantors in turn to sub-vassals.

SWALLOW, the general name for all the insectorial birds distinguished by their long and powerful wings, their short broad beak, their wide gape, their comparatively small and weak legs and feet, and their habit of hawking on the wing for insects, which constitute their food. They are found all over the world except in the coldest regions, and there are a number of species. The common swallow has the nostrils concealed by a membrane in front, and the outer feathers of the tail much elongated. It is about 8½ inches in length. The top of the head is colored of a reddish-chestnut hue, the back and wings being steel-blue. The tail and secondary feathers are black, a dark-blue patch existing at the upper part of the chest, while the throat is a chestnut-brown. The beak, legs, and toes are black, and the under parts



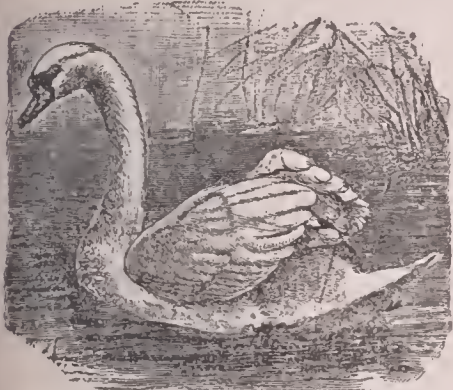
Chimney swallow.

are white or grayish. The females possess the chest-patch, and also the forehead patch of red, of smaller size than the males. The song is weak, and is at best a mere twitter. The nest consists of a cup-shaped structure of mud or clay, sometimes built a few feet down an unused chimney, often close under the roof of some outhouse to which ready access is obtained, and is lined inside with soft grasses, feathers, and other materials. Swallows bear a considerable resemblance to swifts, and among the swifts are several forms which are popularly named "swallows." Thus the bird known in North America as the chimney swallow is not a true swallow, but a swift. The swallow that produces the edible nest is also a swift. Of true

SWAN

swallows, however, several are American, and among them the barn swallow, very similar to the European chimney swallow, the purple martin, and the cliff swallow. The name of "sea swallow" is given to the tern. See also Martin, Sand-martin.

SWAN, a genus of swimming birds, distinguished as a group by the bill being of equal length with the head, and broad throughout its length; by the cere being soft; by the front toes being strongly webbed, while the hinder toe is not webbed, and has no lobe or under-skin. The nest is constructed of reeds and grasses, and is generally situated near the edge of the water on some islet. The young when hatched are of a light bluish-gray color. The food con-



European white swan.

sists of vegetable matters, smaller fishes, worms, etc., and fish-spawn. They have their representatives in North America in the trumpeter swan, and the americanus. South America produces one very distinct species, the beautiful black-necked swan. The black swan of Australia, like the white swan, is frequently kept as an ornament in parks or pleasure grounds. Its large size, and the gracefulness of its form and motions, render the swan one of the most ornamental of all the water-birds.

SWANSDOWN, a name for a fine, soft, thick woolen cloth; or more commonly for a thick cotton cloth with a soft nap on one side.

SWANSEA, a seaport town, and municipal, parl., and county borough of Wales. Copper-works were first established in 1719, and Swansea has now the principal copper-works in Great Britain. Copper ore is imported from Cornwall, Spain, Africa, America, and all parts of the world, and in the immediate neighborhood is an abundant supply of coal for smelting. There are also important tin-works, iron-works, steel-works, zinc-works, alkali-works, etc. Pop. of county bor. 94,514 of parl. bor. 128,052.

SWAZILAND, a small native state in South Africa, forming a dependency of the Transvaal, on the southeast of which it lies; area 8000 sq. miles. Pop. 64,000.

SWEAT. See Perspiration.

SWEATING SYSTEM, the system by which sub-contractors undertake to do work in their own houses or small workshops, and employ others to do it, making a profit for themselves by the difference between the contract prices and the wages they pay their assistants. The

object of the sub-contractor or sweater being to secure as large a margin of profit as possible, the tendency of the system is to grind the workers down to the lowest possible limit.

SWEDEN, a kingdom in the north of Europe, bounded north and west by Norway; southwest by the Skager-Rack, Kattegat, and Sound; south by the Baltic; east by the Baltic and the Gulf of Bothnia; and northeast by the Torneå and its affluent Muonio, separating it from Finland. It consists of the three great divisions of Swealand or Sweden Proper in the middle, Götland or Gottland in the south, and Norrland in the north. For administrative purposes it is divided into twenty-five läns or governments. The total area is 170,979 sq. miles; pop. 5,260,811. The population of Sweden is mainly rural. There are five towns with a population of 30,000 upward, namely, Stockholm (capital), Göteborg or Gottenburg, Malmö, Norrköping, and Gefle. Nearly 2,500,000 of the population are agricultural; about a quarter of a million are cultivators of their own land. The coast-line, above 1400 miles in length, is serrated rather than deeply indented. The west coast is very rocky, but seldom rises so high as 30 feet. A great number of islets are scattered near the shores. There are also two islands of some size: Oeland near the southeast coast, and Gotland further out in the Baltic. The rivers and lakes are very numerous and all belong to the basins of the Baltic sea and the German ocean. Almost the whole of the country is composed of

spring or autumn intervening between the heat of summer and the cold of winter, which in the north lasts for nine, and in the south for seven months. But on the whole the climate is eminently favorable to health, and no country furnishes more numerous instances of longevity. Among the larger wild animals are the wolf, the bear, the elk, the red and roe deer, the lynx, glutton, fox, and even the beaver. Of the smaller animals the most destructive is the lemming. Among birds the most remarkable are eagles, the eagle-owl, and the capercaillie. The rivers and lakes are well stocked with salmon and trout. Timber is the chief export. Of the cereal crops oats, barley, rye, and wheat are cultivated. The potato is grown everywhere. The principal domestic animals are cattle, sheep, horses, swine, and rein-deer. The last, necessarily confined to the north, are kept in large herds by the Laplanders, and supply them at once with food and clothing. The manufacturing industries include those connected with iron, steel, wooden goods, woolens, cottons, silks, refined sugar, leather, paper, spirits, etc. The mercantile marine has a burden of 550,350 tons. There are now over 6000 miles of railway, and 5400 miles of telegraph lines. The chief denomination of money is the krona—27c. The inhabitants of Sweden, with the exception of the Laplanders and Finns, found only in the north belong to the Scandinavian branch of the Teutonic family, and are characterized by a tall, robust stature, light hair, blue eyes, and light complexions.



Scene in Sweden—The Skurusund near Stockholm.

gneiss, partially penetrated by granite. The chief mineral is iron, which is produced in large quantities, of excellent quality, admirably adapted for steel. Zinc, copper, and silver, are also raised. Coal is worked in the south, but is poor in quality. Mining, and especially iron-mining, is one of the most important of Swedish industries. Roughly speaking the mining region occupies the central part of the country, with the forest region to the north and the agricultural region to the south. There is hardly any

The Lutheran faith is recognized as the state religion, but recently there have been extensive secessions from the Established church. Other religions are tolerated; but appointments in the public service can be held by Lutherans only. Elementary education is gratuitous and compulsory, and almost every person can read and write. There are two universities, at Upsala and Lund respectively. The crown is hereditary in the male line. The king must be a member of the Lutheran church, and

has to swear fidelity to the laws of the land. His prerogatives consist of the right to preside in the high court of justice, to grant pardons, to conclude treaties with foreign powers, to declare war and peace, to nominate to all appointments civil and military, and to veto absolutely any decree of the diet. He also possesses legislative power in matters of political administration, but in all other matters that power is exercised, in concert with the sovereign, by the diet, in which is invested the right of imposing taxes. About a third of the revenue is derived from direct taxes and from national property, including railways; the remainder from customs, excise, and other indirect taxes. The army comprises a grand total of 340,000 men, the majority raised by conscription, by annual levy from among men between the ages of 21 and 40. The navy is intended for coast defense, and numbers 13 armored turret ships, 3 torpedo boat destroyers, 5 torpedo gunboats, 34 torpedo boats; unarmored and training vessels. The early history of Sweden is obscure. Christianity was introduced about the beginning of the 11th century. Sweden was more or



A Swedish interior.

less an appanage of the Danish crown until the time of Gustavus Vasa, who raised the peasants of Dalecarlia, defeated the Danes, was elected to the throne in 1523, and received authority to reorganize the church on the basis of Lutheranism in 1527. His son, Erik XIV., reigned only eight years, when, having lost his reason, he was deposed. He was succeeded by his brother, John III., who endeavored to restore the Catholic religion in Sweden; in which, however, he failed. He died in 1592, and was succeeded by his son, Sigismund, who in 1587 had been elected king of Poland. He was succeeded by his uncle Charles IX., who died in 1611 and was succeeded by his son, the celebrated Gustavus Adolphus. Sweden, which; notwithstanding internal troubles, had been advancing in political importance since the time of Gustavus Vasa, now became the leading power of the North; and under Gustavus Adolphus, who espoused the cause of Protestantism in the Thirty Years' war, took for the first time a leading part in the affairs of Europe. Gustavus Adolphus met his death at the battle of

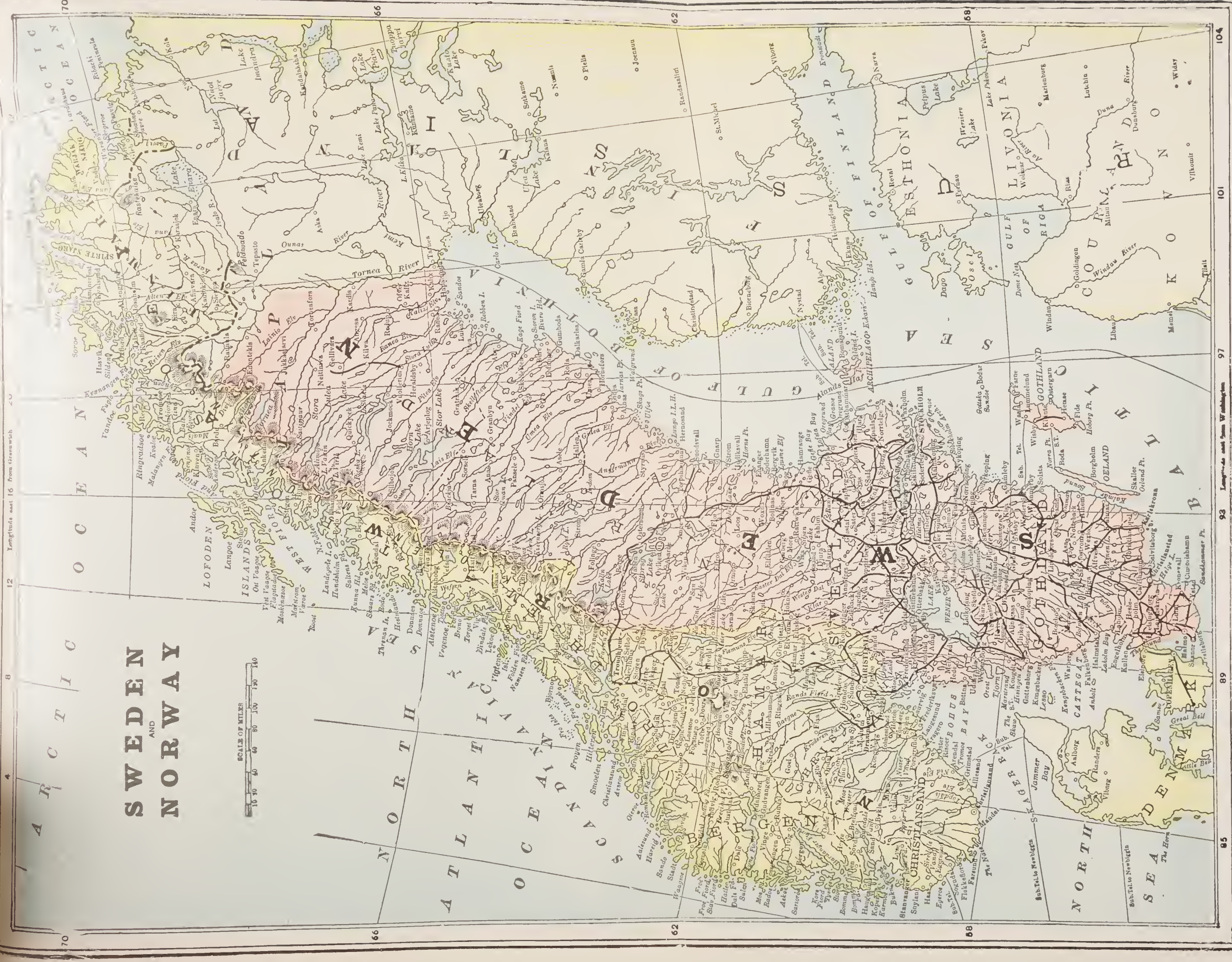
Lützen in 1632, and was succeeded by his daughter Christina, who renounced the crown in 1654 in favor of her cousin, Charles Gustavus, son of the count palatine. The short reign of Charles X. was distinguished by some brilliant military enterprises, which extended to Poland, Prussia, Russia, and Denmark. He died suddenly in 1660, leaving a son, Charles XI., only four years of age. The country was then for long under a council of regency, and carried on a protracted war with Denmark. Charles assumed the government in 1680. He died in 1697, and was succeeded by his son, the celebrated Charles XII. Of the warlike monarchs of Sweden he is the one who has attained the highest reputation for military genius. His career of conquest ended in the disastrous battle of Poltava, 8th July, 1709, which compelled Sweden to yield the presidency among the northern states to Russia, and he was killed at the siege of Frederickshall, 30th November, 1718, while pushing the conquest of Norway. He was succeeded by his second sister, Ulrica Eleonora, who in 1720 associated with her in the government her husband Frederick I. Sweden was now under the hands of an oligarchy, the chief power in the state being held by a secret council of 100 members: 50 of the order of nobles, 25 of the clergy, and 25 of the burghers. This council was divided into two factions, called (after 1738) the Hats and Caps, the former of which preferred to sell themselves to France, the latter to Russia. On the death of Frederick in 1751 Adolphus Frederick of Holstein-Gottorp, by the influences of Russia, was elected king. During his reign the country was distracted by the rivalries of the Hats and Caps, and the royal power sank to a shadow. Adolphus died in 1771, and was succeeded by his son Gustavus III., whose reign was distinguished by a monarchical revolution. He was assassinated in 1792. His son Gustavus IV. was deposed, and his family declared forever incapable of succeeding to the crown, in 1809. His uncle, the Duke of Sudermania, was declared king with the title of Charles XIII. In 1810 the states elected Jean Baptiste Bernadotte, crown-prince. (See Bernadotte.) In the final struggle with Napoleon previous to 1814 Sweden joined the allies, while Denmark took the part of France. The Danes were driven out of Holstein by Bernadotte, and the Treaty of Kiel was concluded between Sweden, Denmark, and Great Britain, January 14, 1814. Sweden by this treaty ceded to Denmark her last German possessions in Pomerania, and the Isle of Rügen, while Denmark was compelled to cede Norway to Sweden as a compensation for the loss of Finland, gained by Russia. Sweden now held the whole Scandinavian peninsula, and had lost all her other European possessions. Bernadotte succeeded to the crown in 1818, under the title of Charles XIV. He died in 1844, and was succeeded by his son Oscar I., whose reign was singularly peaceful and uneventful. He died 8th July, 1859, and was succeeded by his son Charles Louis Eugene, under the title of Charles XV.,

whose reign was marked by constitutional reforms. In 1866 the states, which from time immemorial had met in four chambers, representing the nobility, clergy, citizens, and peasantry, were reduced to the modern composition of two chambers, an upper and a lower, and the suffrage was extended in 1869. Charles XV. died 18th September, 1872, and was succeeded by his brother Oscar II., who proved a wise and prudent ruler, and under whom the country prospered greatly in industry, commerce and otherwise. The dissolution of the Union of Norway and Sweden took place in 1906. Oscar II. died in 1907 and was succeeded by his son Gustaf V.

SWEDENBORG, Emanuel, the founder of the New Jerusalem church, or sect of Swedenborgians, was born at Stockholm in 1688. The period 1710 to 1714 he spent in scientific travels through England, Holland, France, and Germany. In 1716 he was appointed assessor extraordinary in the Royal College of Mines by Charles XII. In 1719 Queen Ulrica raised the Swedberg family to the rank of nobility, upon which occasion the name was changed to Swedenborg. He increased his stock of knowledge by new travels in 1736-40 in Germany, Holland, France, Italy, and England. He was first introduced to an intercourse with the spiritual world in detail, according to his own statement, in 1743 at London. The eyes of his inward man, he says, were opened to see heaven, hell, and the world of spirits, in which he conversed, not only with his deceased acquaintances, but with the most distinguished men of antiquity. His theological works, written in Latin between the years 1747 and 1771, found but a limited number of readers; and while he was an object of the deepest veneration and wonder to his few followers, his statements were the more mysterious to the rest of the world because he could not be suspected of dishonesty, and exhibited profound learning, keenness of intellect, and unfeigned piety. His works are very numerous, among the more important of them being the *Arcana Coelestia*, the *New Jerusalem*, *Angelic Wisdom*, the *Apocalypse Explained*, *Heaven and Hell*, etc. With uninterrupted health he attained the age of eighty-four, and died of apoplexy in London, March 29, 1772.

SWEDENBORGIANs, the followers of Swedenborg, and particularly the members of what is called the New Jerusalem church, or New church. This body adopts the doctrinal tenets and method of Biblical interpretation laid down in the writings of Emanuel Swedenborg. The belief of the Swedenborgians is: that Jesus Christ is God, in whom is a trinity not of persons but essentials, answering to the soul, body, and the operation of these in a man; that the Scriptures contain an internal or spiritual meaning, which is the Word existing in heaven; that the key to this is the correspondence between natural and spiritual things, as between effects and their causes; that man is saved by shunning evils as sins and leading a life according to the ten commandments; that man is a spirit clothed with a

SWEDEN AND NORWAY



SWEET-BREAD

natural body for life on earth, and then when he puts it off at death he continues to live as before but in the spiritual world, first in an intermediate state between heaven and hell, but afterward, when his character, whether good or evil becomes harmonious throughout, among his like either in heaven or hell; that the Lord's second coming and the last judgment are spiritual events which have already taken place.

SWEET-BREAD. See Pancreas.

SWEET-BRIAR, or SWEET-BRIER, a species of rose, which grows wild, but is often planted in hedges and gardens on account of the sweet balsamic smell of its small leaves and flowers. It is also called the eglantine.

SWEET-FLAG, a plant, also called Sweet-rush, found in marshy places throughout the northern hemisphere. The leaves are all radical, long, and sword-shaped; the stem bears a lateral, dense, greenish spike of flowers; the root is long, cylindrical, and knotted. The root has a strong aromatic odor, and a warm, pungent, bitterish taste, and has been employed in medicine since the time of Hippocrates. It is also used by confectioners as a candy, and by perfumers in the preparation of aromatic vinegar, hair-powder, etc.

SWEET-PEA, a garden plant cultivated on account of the beauty of its flowers, which are sweet-scented, and in color purple, rose, white, or variegated.

SWEET-POTATO, a plant now cultivated in all the warmer parts of the globe. It is the potato of Shakespeare and contemporary writers, the common potato being then scarcely known in



Sweet-potato.

Europe. The consumption of the sweet-potato is very large in many parts, including the United States and the warmer parts of America, the East Indies, etc.

SWEET-WILLIAM, a species of pink. It grows wild in dry and sterile places in middle and southern Europe.

SWELL, in music, a gradual increase and decrease of sound; the crescendo and diminuendo combined. Also an arrangement in an organ (and in some harmoniums) whereby the player can increase or diminish the intensity of the sound at will. In the organ it consists of a series of pipes with a separate keyboard, and forming a separate department (called the swell-organ). The loudness or softness of the tone is regulated by opening or shutting, by means of a pedal, a set of slats like a Venetian blind, which forms part of the frame in which the pipes are inclosed.

SWIFT, though swifts are like swal-

lows in many respects, their structure is almost entirely different, and some naturalists rather class them with the humming birds, or the goat-suckers. The swift has all four toes directed forward; it is larger than the swallow; its flight is more rapid and steady; and its scream is very different from the twittering of the swallow. It has the greatest powers of flight of any bird that visits Britain. Its weight is most disproportionately small to its extent of wing, the former being scarcely an ounce, the latter 18 inches, the length of the body being about 8 inches. Its color is a



Common swift.

somber or sooty black, a whitish patch appearing beneath the chin. It builds in holes in the roofs of houses, in towers, or in hollow trees. It leaves Britain in August, having arrived from Africa early in May. A larger species, with the lower parts dusky white, has its home in the mountainous parts of Central and Southern Europe. A common North American swift is the so-called chimney swallow, which builds its nest in chimneys. The swifts or swiftlets which inhabit chiefly the islands of the Indian ocean from the north of Madagascar eastward, construct the edible birds'-nests which are used by Chinese epicures in the making of soup.

SWIFT, Gustavus Franklin, an American merchant, born at Cape Cod, Mass., in 1839. He engaged in meat-packing in Chicago, and was the first to ship meat long distances successfully. He founded and was president of the corporation of Swift and company, one of the largest packing firms in the United States, and was a prominent member of many other similar concerns. He died in 1903.

SWIFT, Jonathan, the greatest of English satirists, was born in Dublin, November 30, 1667. In 1701 he took his doctor's degree, and in 1704 he published anonymously his famous Tale of a Tub, to which was appended the Battle of the Books. In 1708 appeared, among other things, an attack upon astrology under the title of Predictions for the Year 1708, by Isaac Bickerstaff, Esq., and in 1709 a Project for the Advancement of Religion, dedicated to Lady Berkeley, the only work to which he ever put his name. A bishopric in England was the object of his ambition; but the only preferment he obtained from his ministerial friends was the Irish deanery of St. Patrick's, to which he was presented in 1713. His famous Gulliver's Travels appeared in 1726. He died in 1745, bequeathing the greatest part of his fortune to an hospital for lunatics and

idiots. As a writer he has, perhaps, never been exceeded in grave irony. He abounds in ludicrous ideas, which often deviate, both in his poetry and prose, into very unpardonable grossness.

SWIMMING, the act or art of sustaining and propelling the body in water. A large proportion of the animal tribes are furnished with a greater or less capacity for swimming either in water or on its surface, but man is unqualified for swimming without learning to do so as an art. The art of swimming chiefly consists in keeping the head, or at least the mouth, above water, and using the hands and feet as oars and helm. Want of confidence is the greatest obstacle in the way of most who begin to learn swimming. The beginner cannot persuade himself that the water will support him, and with the feeling that some muscular effort is necessary for the purpose stiffens his back in such a way that the water cannot buoy him up with the head above water. If, instead of doing this, he would give up the endeavor to support himself by a muscular strain, and trust to the water to support him like a cushion, the art of swimming would come to him almost as naturally as the art of walking does to a child. When the ability to swim in the ordinary way, chest downward, is acquired, everything is acquired. It is as unnecessary to give special instructions for swimming on the back, on the side, etc., as it is to direct people who are able to walk how to turn themselves or walk up or down hill. In saving a person from drowning, which can be done most effectually if he has already lost consciousness, pull him by the hair, or push him before you, if far from shore; otherwise take him by the arm. An excellent method of supporting another in the water is to allow the person supported to rest his hands on your hips. This method can scarcely be practiced in cases where persons unable to swim are drowning; but it may be of much avail in supporting a brother swimmer who is attacked with weakness or cramp, and who has presence of mind to take advantage of the support.

SWIMMING-BLADDER, AIR-BLADDER, or SOUND (of fishes), the names applied to a sac or bladder-like structure found in most, but not in all fishes, the chief office of which appears to consist in altering the specific gravity of the fish, and thus enabling it to rise or sink at will in the surrounding water. It has a homology or structural correspondence with the lungs of higher forms than fishes; but it has no analogy or functional correspondence with the lungs or breathing organs, save in the peculiar Lepidosirens or mud-fishes, in which the air-bladder becomes cellular in structure, and otherwise assumes a lung-like structure and function. In its simplest condition it exists as a closed sac lying beneath the spine, and containing air or gases of different kinds. By the muscular compression of its walls the density of the contained gas is altered, and the specific gravity of the fish affected accordingly, so as to change its position in the water. In most sea-fishes the gas which the swimming-bladder contains is oxygen.

that in the air-sac of fresh-water fishes being mostly nitrogen. Such fishes as the flat-fishes, represented by the flounders, soles, etc., have no swimming-bladder developed, and it may be absent in other forms, such as sharks, rays, lampreys, etc.

SWINBURNE, Algernon Charles, poet and essayist, was born in London 1837. His first productions, *Queen Mother* and *Rosamond*, published in 1861, attracted but little attention. They were followed by two tragedies, *Atalanta in Calydon* and *Chastelard*, and by *Poems and Ballads* which excited considerable criticism. Since that time Swinburne has been prominently before the public. Among his numerous later works may be mentioned: *A Song of Italy*, William Blake, a critical essay; *Songs before Sunrise*, Bothwell, a tragedy; *Poems and Ballads* (2d series), Mary Stuart, a tragedy; *Tristram of Lyonesse*, etc. *A Century of Roundels*, Marino Faliero, a tragedy; *Poems and Ballads* (3rd series), *Astrophel* and other *Poems*; etc. He died in 1909.

SWINE. See Hog.

SWINE FEVER, or **SWINE PLAGUE**, is known as hog cholera in America, where it has caused enormous losses. It is a specific contagious fever, generally very rapid in its course, death ensuing in a very few days. To suppress the disease, all affected pigs must be killed, and if necessary those which have been in contact with them, and the carcasses and litter burned or deeply buried.

SWING, David, American preacher, born in 1830 in Cincinnati. In 1866 he was called to the Fourth Presbyterian church in Chicago. In 1874 he was tried for heresy and acquitted, but, resigned his pastorate and withdrew from the Presbyterian ministry. He organized a new church, meeting at first in a theater and later in the Central Music Hall, where Dr. Swing continued to preach to one of the largest congregations in Chicago until his death. He died in 1894.

SWING-BRIDGE, called also swivel-bridge and pivot-bridge, a bridge that may be moved by swinging, so as to afford a passage for ships on a river, canal, at the mouth of docks, etc. In one form the whole bridge is swung to one side; in another it rotates from its center on a pier in the middle of the water-way, so as to make a passage on each side of it; while in a third it consists of two sections, each of which, when opened, is landed on its own side.

SWISS GUARDS, bodies of mercenary Swiss troops which, since Switzerland gained her independence in the 15th century, have been employed in many European countries as body-guards, and for duty about courts. The most famous are the French Swiss guards organized in 1616, and annihilated in the defense of the Tuileries, August 10, 1792, whose heroism is commemorated in Thorwaldsen's colossal Lion, carved in the face of a rock at Lucerne. The French Swiss guards were reorganized by Louis XVIII. in 1815, and defeated and dispersed in the revolution of 1830.

SWITCHES. See Railways.

SWITHIN, St., bishop of Winchester

from 852 to 862, and patron saint of Winchester cathedral from the 10th to the 16th century. The popular knowledge of this saint's name is due to the belief that if rain falls on the 15th of July (which is popularly known as St. Swithin's Day) it will rain for six weeks after. Similar superstitions are connected in various continental countries with other saints' days which occur in summer.

SWITZERLAND, a federal republic of Central Europe, bounded north by Baden, from which it is separated for the most part by the Rhine; northeast by Württemberg and Bavaria, from which it is separated by the Lake of Constance; east by the principality of Lichtenstein and the Tyrol, from which it is separated by the Rhine and the Grisons Alps; south by Italy, from which it is separated by the Alps and the Lake of Geneva; and west and northwest by France, from which it is separated in part by the Jura mountains and the River Doubs. Greatest length, 210 miles; greatest breadth, 126 miles. Pop. 3,292,551. The largest towns are Zürich, Basel, Geneva, and Bern, the last being the federal capital. The characteristic physical features of Switzerland are its lofty mountain ranges, enormous glaciers, magnificent lakes, and wild romantic valleys. The loftiest mountain-chains belong to the Alps, and are situated chiefly in the south. The central nucleus is Mount St. Gothard, which unites the principal watersheds of Europe. In like manner it forms a kind of starting point for the loftiest ranges of the Alps. Besides the Alps, properly so called, the only range deserving of notice is that of the Jura, which is linked to the Alps by the small range of the Jorat. The principal rivers are the Rhine, the Rhone, the Aar, and the Inn. The largest lakes, that of Geneva in the southwest and of Constance in the northeast, as well as that of Maggiore on the south side of the Alps, belong partly to other countries; but within the limits of Switzerland, and not far from its center, are Lake Neuchâtel, with Morat and Bienne in its vicinity, Thun with its feeder Brienz, Lucerne, or Vierwaldstätter-see, Sem-pach, Baldegg, Zug, Zürich, and Wal-lenstätter-see. All these internal lakes belong to the basin of the Rhine. All the loftiest alpine ranges have a nucleus of granite, on which gneiss and mica-slate recline generally at a high angle. Coal-bearing strata are found in the cantons of Valais, Vaud, Freiburg, Bern, and Thurgau, and brown coal is obtained in St. Gall and Zürich. Iron is worked to advantage in several quarters, particularly among the strata connected with the Jura limestone. Rock and common salt are produced to some extent in the cantons of Vaud, Basel, and Aargau. The only other minerals deserving of notice are alabaster and marble, widely diffused; and asphalte, in the Val-de-Travers in the canton of Valais. Mineral springs occur in many quarters. Owing to differences of elevation the climate is extremely variable even in the same localities. Owing to the same cause, few countries in Europe even of larger extent can boast of a

more varied vegetation than Switzerland. In regard to vegetation it has been divided into seven regions. The characteristic product of the first is the vine, which grows up to 1700 or 1800 feet above the sea-level. The next is the hilly or lower mountain region, rising to the height of 2800 feet, and characterized by the luxuriance of its walnut trees, with good crops of spelt and excellent meadows. The third or upper mountain region, which has its limit at 4000 feet, produces forest timber, more especially beech, and has good crops of barley and oats, and excellent pastures. Above this, and up to the height of 5500 feet, is the fourth or subalpine region, distinguished by its pine forests and maples; here no regular crops are grown; The fifth or lower alpine region, terminating at 6500 feet, is the proper region of alpine pastures. In the sixth or upper alpine region the vegetation becomes more and more stunted, and the variation of the seasons is lost. The seventh or last region is that of perpetual snow. The chief crops are wheat, spelt, rye, oats, and potatoes. The wine produced is mostly of inferior quality. Considerable quantities of fruit are grown. Among domestic animals the



Group of Swiss, District of Appenzell.

first place belongs to the horned cattle, and the dairy products of Switzerland are of special commercial importance, great quantities of cheese and condensed milk being exported. On the higher grounds goats are very numerous. Among wild animals are bears, wolves, chamois, wild boars, stags, badgers, foxes, hares, otters, birds of prey of large dimensions, and many varieties of winged game. The lakes and rivers are well supplied with fish. Of the population about 40 per cent are dependent on agriculture, and about 34 per cent on manufacturing industry. Switzerland is thus mainly an agricultural and manufacturing country. The system of peasant proprietorship prevails largely, it being estimated that there are nearly 300,000 peasant proprietors. The principal manufactures are cotton, silk, embroidery, watches and jewelry, machinery and iron, tobacco and wool. Geneva is the chief seat of the watch industry, Basel of the silk industry, and St. Gallen of embroidery. Switzerland being an inland country, has direct commercial intercourse only with the surrounding states; but the trade with other countries, especially Great Britain and the United States, is very important. There are now fully 2300 miles of railway. There is a very complete

This is a detailed historical map of Switzerland and its surrounding regions, including parts of France, Germany, and Italy. The map is oriented with North at the top. It features a coordinate grid with latitude and longitude markings along the edges. A scale of miles is provided in the top left corner, ranging from 0 to 30. The map shows major cities and towns, including Basel, Bern, Lucerne, Zurich, and Geneva. It also depicts the Alpine mountain ranges, Lake Geneva, and the Rhine River. The map is labeled with various geographical features, including mountains, rivers, and lakes. The text is in English, and the map is credited to C.S. Hammond & Co., N.Y.

SCALE OF MILES
0 5 10 15 20 25 30

Size of type indicates relative importance of places.

Hammond's 8x11 Map of Switzerland
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SWITZERLAND

SCALE OF MILES
0 5 10 15 20 25 30

Size of type indicates relative importance of places.

Hammond's 1891 Map of Switzerland
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Hammond's 8x11 Map of Switzerland
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This is a detailed historical map of Switzerland and its surrounding regions, including parts of France, Germany, and Italy. The map is oriented with North at the top. It features a coordinate grid with latitude and longitude markings along the edges. A scale of miles is provided in the top left corner, ranging from 0 to 30. The map shows major cities and towns, with their names written in a historical script. Key geographical features include the Alpine mountain ranges, Lake Geneva, and the Rhine River. The map is color-coded to show different regions and political boundaries. The title 'SWITZERLAND' is prominently displayed at the top left. The map is a reproduction of a historical document, likely from a travel guide or a historical atlas.

SCALE OF MILES
0 5 10 15 20 25 30

Size of type indicates relative importance of places.

SWITZERLAND

Hammond's 1881 Map of Switzerland
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This is a detailed historical map of Switzerland and its surrounding regions, including parts of France, Germany, and Italy. The map is oriented with North at the top. It features a coordinate grid with latitude and longitude markings along the edges. A scale of miles is provided in the top left corner, ranging from 0 to 30. The map shows major cities and towns, including Basel, Bern, Lucerne, Zurich, and Geneva. It also depicts the Alpine mountain ranges, Lake Geneva, and the Rhine River. The map is labeled with various geographical features, including mountains, rivers, and lakes. The text is in English, and the map is credited to C.S. Hammond & Co., N.Y.

SCALE OF MILES
0 5 10 15 20 25 30

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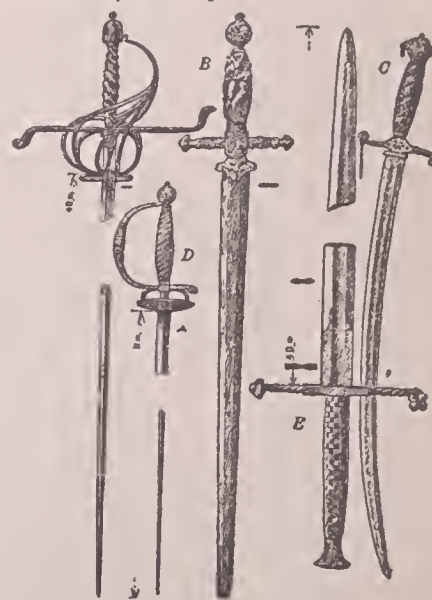
Hammond's 8x11 Map of Switzerland
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system of telegraphs. The French metric system of money, weights, and measures has been generally adopted in Switzerland. Both the Evangelical-reformed church and the Roman Catholic are national churches in Switzerland, about 59 per cent of the inhabitants belonging to the former, and 41 per cent to the latter. There is complete liberty of conscience and creed, but the order of the Jesuits and the societies affiliated to it are not allowed within the confederation. In terms of the constitution of 1874 primary education is secular and compulsory throughout the confederation. For the higher education there are five universities, Basel, Zürich, Geneva, Berne, Lausanne, the first founded in 1460, and the others since 1832. There are also academies or incomplete universities at Fribourg and Neuchâtel; a polytechnic school at Zürich; and a military academy at Thun. The cantons of Switzerland are united together as a federal republic for mutual defense, but retain their individual independence in regard to all matters of internal administration. The legislative power of the confederation belongs to a federal assembly, and the executive power to a federal council. The federal assembly is composed of two divisions—the national council, and the state council or senate. The national council is elected every three years by the cantons—one member to each 20,000. Every lay Swiss citizen is eligible. The senate consists of forty-four members—two for each canton. In addition to its legislative functions the federal assembly possesses the exclusive right of concluding treaties of alliance with other countries, declaring war and signing peace, sanctioning the cantonal constitutions, and taking measures regarding neutrality and intervention. The army consists of the Bundesauszug, or federal army, comprising all men able to bear arms from the age of twenty to thirty-two; and the Landwehr, or militia, comprising all men from the age of thirty-two to forty-four. In 1907 the Bundesauszug had a strength of 153,649, and the Landwehr of 88,813, making a total of 242,642. There is also, by a law of 1887, a Landsturm (of 283,643 men), in which every citizen between the ages of seventeen and fifty, not otherwise serving, is liable to be called out only in time of war. The Swiss are a mixed people as to race and language. German, French, Italian, and a corrupt kind of Latin called Rhetian or Roumansch, are spoken in different parts. The Swiss, however, have lived so long in a state of confederation that, apart from these peculiarities of origin and language, they have acquired a decided national character, and may now be viewed as forming a single people. The oldest inhabitants mentioned in written history are the Helvetians, who, between 58 B.C. and 10 A.D., were subjugated by the Romans. Before the fall of the Roman empire in the West, Switzerland was occupied by the German confederation of the Alemanni; by the Burgundians and the Lombards; and by the year 534, under the successors of Clovis, it had become

a portion of the Frankish empire. Under the successors of Charlemagne it was divided between the Kingdom of France and the German empire, but ultimately the whole country fell to Germany. For the most part, however, the dependence of Switzerland on Germany was merely nominal. The counts (originally local governors) conducted themselves as princes, assumed the name of their castles, and compelled the free inhabitants of their Gaus (districts) to acknowledge them as their lords. At the beginning of the 13th century the three forest cantons of Uri, Schwyz, and Unterwalden were subject to the counts of Hapsburg, who, although they were properly only imperial bailiffs (Vögte), yet regarded themselves as sovereign rulers. This claim the three cantons constantly refused to admit, and eventually (1291) leagued themselves together to oppose the usurpations of the house of Hapsburg. On January 1, 1308, the Austrian governors were deposed and expelled. A few years later the three cantons were invaded by the Hapsburgs; but the signal victory at the pass of Morgarten on the 15th of November, 1315, secured the independence of the cantons. The three united cantons were joined by the cities of Lucerne (1332) and Zürich (1351), the cantons of Glarus and Zug (1352), and the city of Bern (1353). Austria, which claimed jurisdiction over three of the newly-added members, namely, the city of Lucerne and the cantons of Glarus and Zug, again invaded the territory of the confederation, but was completely defeated at Sempach in 1386, and in 1388 at Näfels. The canton of Appenzell joined the confederation in 1411, and Aargau was wrested from the Austrians in 1415. The third war with Austria terminated in 1460, in favor of the confederation, which obtained Thurgau, Austria being thus deprived of all its possessions in the regions over which Switzerland now extends. They admitted Freiburg and Solothurn into the confederation in 1481, and about the same time they concluded defensive alliances with several of the neighboring states. The last war with Austria broke out in 1498. The Swiss had to undergo a severe struggle, but, victors in six sanguinary battles, they were, by the Peace of Basel in 1499, practically separated from the empire, a separation to which formal and international sanction was given in 1648. After this war they had no longer any enemy to fear, and their future wars were waged on behalf of foreign powers. In 1501 Basel and Schaffhausen, and in 1513 Appenzell were admitted into full federation. The number of the cantons was thus brought up to thirteen, at which it remained till 1798. The town and the abbot of St. Gall and the town of Bienne had seats and votes in the diet without being in full federation; and there were besides six allies of the confederation not enjoying these privileges—the Grisons, Valais, Geneva, Neuchâtel, Mühlhausen, and the bishopric of Basel. In 1516 France gave up to Switzerland the whole of the present canton of Ticino. In 1518 the Reformation began to make its way into Switzerland, chiefly through the efforts

of Zuinglius at Zürich. Zuinglius fell at Kappel (1531), but his work was carried on by Calvin at Geneva. The effect of the Reformation for long was to divide Switzerland into separate camps. The last time the two great parties met in arms was at Willmergen in 1712, when victory declared itself for the Protestants. In almost every department of human knowledge the Swiss of the 18th century, both at home and abroad, acquired distinguished reputation. In the last years of the century the ferment of the French revolution spread to Switzerland; and in 1798 the ancient confederation was replaced by the Helvetic Republic, which lasted four years. In 1803 Napoleon I. organized a new confederation, composed of nineteen cantons, by the addition of Aargau, Grisons, St. Gall, Ticino, Thurgau, and Pays de Vaud. In 1815, by the compact of Zürich, Neuchâtel, Geneva, and Valais were admitted into the confederacy, and the number of the cantons was thus brought up to twenty-two. This confederacy was acknowledged by the congress of Vienna, which proclaimed the perpetual neutrality of Switzerland, and the inviolability of its soil. Again, in 1830 and in 1848, Switzerland was affected by the revolutionary movement in France, and a new federal constitution was introduced in the latter year. During the commotions of 1848 Neuchâtel set aside its monarchical form of government and adopted a republican one, and in 1857 it was put upon the same footing with the other cantons. Since that time the annals of Switzerland have little to record beyond the fact of constant moral and material progress. A revision of the federal constitution was adopted after a protracted agitation on the 19th of April, 1874, giving to the federal authorities more power in matters relating to law, the army, the church, and education.

SWORD, a weapon used in hand-to-



Swords.

a, Rapier, 16th century; b, Italian sword, wrought-bronze hilt; c, French hunting-sword, 18th century; d, Small sword, 18th century; e, Knights' sword, 15th century.

hand encounters consisting of a steel blade and a hilt or handle for wielding

SWORD-FISH

it. The blade may be either straight or curved, one-edged, or two-edged, sharp at the end for thrusting, or blunt. The ancient Greek swords were of bronze, and later of iron. The Romans in the time of Polybius (B.C. 150) had short, straight swords of finely-tempered steel. The straight, long sword was used by the Christians of the West in the middle ages, while the Poles and all the tribes of Slavonic origin employed, and still prefer, the crooked sword or scimitar, which was also used by the Saracens, and is still the common one in the East. The double-handed sword of the middle ages was an unwieldy weapon, and probably originated from the wearing of plate armor. The sword is of much less importance in warfare than formerly, but European cavalry are still armed with it. From the former importance of the sword it came to be connected with various matters of ceremonial. The sword of state is one of the regalia, and the "offering of the sword" one of the ceremonies of coronation. Damascus, Toledo, and Milan were anciently famous for their sword-blades. In England, at the present day, the government seat of the sword manufacture is Birmingham. See Broadsword, Cutlass, Rapier, and Scimitar; also Cutlery and Fencing.

SWORD-FISH, a fish allied to the mackerel and represented by the common sword-fish, the single known species. It occurs in the Mediterranean sea and Atlantic ocean, but may also be occasionally found round the coasts of Britain. It attains a length of from 12 to 15, or even 20 feet, the elongated upper jaw, or sword, forming three-tenths of its length. Its body is covered



Sword-fish.

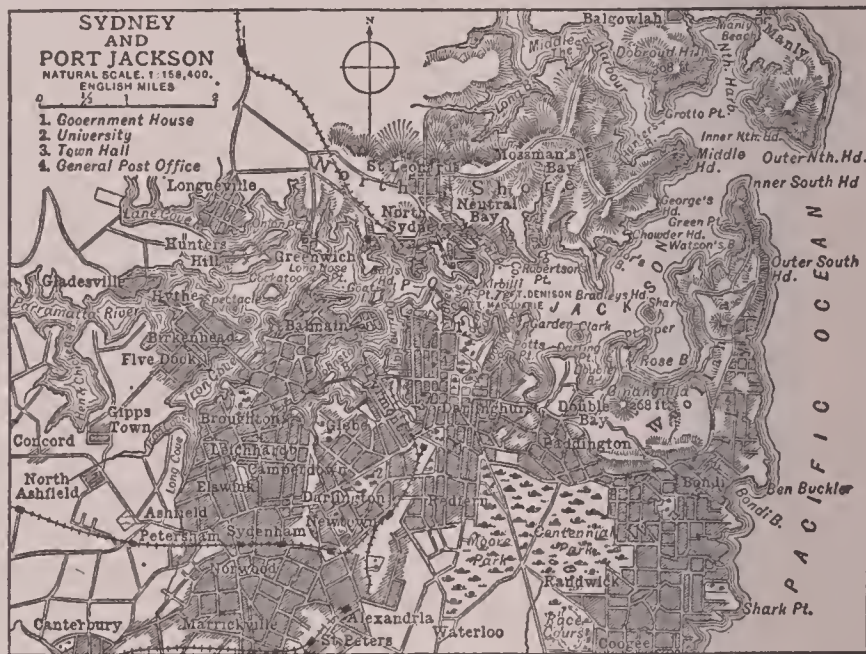
with minute scales. Its color is a bluish-black above, and silvery white on the under parts. The ventral fins are wanting. It is fished for by the Neapolitan and Sicilian fishermen with the harpoon. Its flesh is very palatable and nutritious. It attacks other fishes, and often inflicts fatal wounds with its powerful weapon; and there are frequent instances in which the timbers of ships have been found to be perforated through and through by the sword-like jaw, which has been left sticking in the wood.

SYCAMORE, a large and well-known timber tree in the western parts of the United States, a name for the occidental plane or buttonwood. For the Sycamore of Scripture see Sycomore.

SYCOMORE, a kind of fig-tree. It is very common in Palestine, Arabia, and Egypt, growing thick and to a great height, and though the grain is coarse, much used in building, and very durable. Its wide-spreading branches afford a grateful shade in those hot climates, and its fruit, which is produced in clusters

upon the trunk and the old limbs, is sweet and delicate.

SYDNEY, the capital of New South Wales and the parent city of Australia, is situated on the southern shore of Port Jackson, the shore line being deeply indented by capacious bays or inlets which form harbors in themselves, and are lined with wharves, quays, and warehouses. Among the most important public buildings are the new government offices, the town-hall, with a tower 200 feet high, and a very capacious great hall; the post-office, an Italian building with a tower 250 feet high; the government house; the university, a Gothic building with a frontage of nearly 400 feet, situated in a fine park;



the free public library; school of art; public museum; grammar-school; St. Andrew's (Episcopal) cathedral; St. Mary's (R.C.) cathedral; the Jewish synagogue; exchange; custom-house; mint; parliament houses; hospitals, asylums, and numerous other ecclesiastical, scholastic, and business buildings. The principal exports are wool, tallow, hides, preserved meat, tin, copper, etc.; the imports, grain, tea, coffee, sugar, wine and spirits, ironware and machinery, cotton and woolen goods, wearing apparel, furniture, etc. The discovery of gold in the colony in 1851 gave an immense impetus to its progress. Pop. 618,462.

SYLVESTER, Joshua, English poet, born in 1563, was a member of the company of merchant adventurers at Stade, Holland. He is known chiefly as the translator into English of the Divine Weeks and Works of the French poet Du Bartas. He died in 1618.

SYMBOL, a sign by which one knows or infers a thing; an emblem. It is generally a definite visible figure intended to represent or stand for something else, as in the case of the common astronomical symbols, which are signs conventionally representing astronomical objects, phases of the moon, etc., and astronomical terms. Some of these symbols are so ancient that we can find no satisfactory account of their origin.

SYMPATHY

The symbols for the chief heavenly bodies are as follows:

Sun ☉, Mercury ☿, Venus ♀, Earth ♂ and ⊕, Moon ☾, Mars ♂, Ceres ♀, Pallas ♀, Juno ♀, Vesta ♀, Jupiter ♃, Saturn ♄, Uranus ♅, Neptune ♆, Comet ☄, Star ☆. The asteroids, except the four given above, are represented by a circle with a number, thus, (64). **Lunar Phases.** ● Moon in conjunction, or new; ☾ Moon in eastern quadrature, or first quarter; ○ Moon in opposition, or full; ☾ Moon in western quadrature, or last quarter. See *Ecliptic*.—

Chemical symbols are merely the first letters of the names of the chemical elements; or, when the names of two or

more elements begin with the same letter, two letters are used as the symbol, one of which is always the first letter of the name of the element. Generally speaking the letters comprising the symbol are taken from the English name of the element; but in some instances, specially in the case of metals which have been long known, the symbols are derived from the Latin names, as Fe (Lat. ferrum) for iron. See *Chemistry*.—Mathematical symbols are letters and characters which represent quantities or magnitudes, and point out their relations, as, a'' , a_n ; a^2 , a_2 ; a^m , a ; the signs, +, −, ×, ÷, √, ∫, =, <, >, etc.

SYMPATHETIC INKS, inks which remain invisible until acted upon by heat or by some other reagent. See *Ink*.

SYMPATHETIC NERVOUS SYSTEM, the name applied to a set of nerves in vertebrate animals, forming a nervous system distinct from, and yet connected with, the chief nerve-centers, or cerebro-spinal nervous system. They are specially connected with the processes of organic life, the movements of the heart and of respiration, the work of the stomach, etc., in digestion, the process of secretion in glands, etc. See *Nerve*.

SYM'PATHY, in physiology, is that quality of the animal organization by which, through the increased or diminished activity of one organ, that of

others is also increased or diminished. The idea of an organized system—the union of many parts in one whole, in which all these parts correspond to each other—includes the idea of a mutual operation, of which sympathy is a part. The sympathetic medium has been sometimes supposed to be the nervous system, sometimes the vascular or cellular system; but sympathy takes place between such organs as have no discoverable connection by nerves or vessels. The phenomenon of sympathy appears even in the healthy body; but its effect is much more often observed in diseases. Sympathy is further used to express the influence of the pathological state of one individual upon another, as in the contagion of hysteria or of yawning.

SYMPHONY, an elaborate musical composition for a full orchestra, consisting usually, like the sonata, of three or four contrasted, yet inwardly related movements. Haydn, Mozart, Mendelssohn, and Beethoven are the most successful composers of this class of compositions.

SYMPTOMS, in medicine, the phenomena of diseases, from which we infer the existence and the nature of the disease. Symptoms have their seat in the functions which are affected by the disease, and may be perceptible by the patient alone (for example, pain and all change of sensations), or by the physician also (for example, all diseased movements). The nervous, the vascular, and the cutaneous systems are affected in most diseases, and thus afford symptoms. If the symptoms are perceptible only to the patient they are called subjective; if to the physician without necessary reference to the patient, they are objective.

SYNAGOGUE, the recognized place of public worship among the Jews. Its origin, it is supposed, belongs most probably to the date of the Babylonish captivity in the abeyance of temple worship. The synagogues were so constructed that the worshippers, as they entered and as they prayed, looked toward Jerusalem. At the extreme east end was the holy ark, containing copies of the Pentateuch; in front of this was the raised platform for the reader or preacher. The men sat on one side of the synagogue and the women on the other, a partition 5 or 6 feet high dividing them. The chief seats, after which the scribes and Pharisees strove, were situated near the east end. The constitution of the synagogue was congregational, not priestly, and the office-bearers were not hereditary, but were chosen by the congregation. A college of elders, presided over by one who was the ruler of the synagogue, managed the affairs of the synagogue, and possessed the power of excommunication. The officiating minister was the chief reader of the prayers, the law, the prophets, etc. The servant of the synagogue, who had the general charge of the building, generally acted on week-days as school-master to the young of the congregation. The right of instruction was not strictly confined to the regularly-appointed teachers, but the ruler of the synagogue might call upon anyone present to ad-

dress the people, or even a stranger might volunteer to speak. The modern synagogue differs little from the ancient. Instead of elders there is a committee of management; and the women are now provided with seats in a low latticed gallery.—The Great Synagogue was an assembly or council of 120 members, said to have been founded and presided over by Ezra after the return from the captivity. Their duties are supposed to have been the remodelling of the religious life of the people, and the collecting and redacting of the sacred books of former times.

SYNCOPE (sin'ko-pē), the name given to that form of death characterized by failure and cessation of the heart's action as its primary feature. The term is also applied to the state of fainting produced by a diminution or interruption of the action of the heart, and of respiration, accompanied with a suspension of the action of the brain and a temporary loss of sensation, volition, and other faculties. Fatal syncope is usually the result of some nervous "shock," resulting from some severe lesion of organs, or from a want of blood or an altered and abnormal state of blood pressure. Ordinarily syncope is caused chiefly by weakness, mental emotion, etc. The fainting patient should be laid on a couch and the head kept low; while great caution must be observed in stimulating the action of the heart.

SYNDIC, an officer intrusted with the affairs of a city or other community; also, a person appointed to act in some particular affair in which he has a common interest with his constituents, as when he is one among several creditors of the same debtor.

SYNDICATES, originally, councils or bodies of syndics; afterward, associations of persons formed with the view of promoting some particular enterprise, discharging some trust, or the like; now, combinations of capitalists for the purpose of controlling production and raising prices. Formerly, combinations of capitalists simply aimed at an agreement as to how much each should produce, and what common price should be charged to the public, each producer still retaining control over his own business; but modern syndicates have absolute control over the operations of all the consenting parties, and aim at obtaining entire control of the industries with which they deal, so that both producer and consumer shall be at their mercy. Syndicates, in their modern form, originated in the United States, where they have been introduced into all the leading branches of trade, and are now in operation on a very extensive scale. From the United States they were transplanted to the continent of Europe, where they found a congenial soil, especially in Germany. Their introduction into Britain is of more recent date, but they promise to become as general there as elsewhere.

SYNOD, an ecclesiastical assembly convened to consult on church affairs. A synod may be diocesan, composed of a bishop and the clergy of his diocese; or provincial, of an archbishop and the bishops and clergy of his province; or

national, of the whole clergy of a state under a papal legate. The convocations of the English clergy are provincial synods. Synods in the Presbyterian church are courts of review standing between the presbyteries and the general assembly, and embracing a certain number of associated presbyteries, the clergy and elders of which constitute the respective synods.

SYNOPTIC GOSPELS, a term applied to the gospels of St. Matthew, St. Mark, and St. Luke, which present a synopsis or general view of the same series of events. In St. John's gospel the events narrated are different. See Gospel.

SYNTAX, that part of grammar which treats of the manner of connecting words into regular sentences, constructing sentences by the due arrangement of words or members in their mutual relations according to established usage. In every language there is some fundamental principle which pervades and regulates its whole construction, although it may occasionally admit of particular variations. In some languages the principle of juxtaposition prevails, and little diversity of arrangement is possible, as is the case in English, in which inflections are so few. The relations of the subject, the action, and the object are indicated by their respective position. In other languages—inflected languages like Latin or Greek—these relations are indicated by the changes in the forms of the words, and the modes of arrangement are various. Still, in the structure and disposition of sentences and parts of sentences the logical relations of the thoughts must regulate the construction, even where it appears to be most arbitrary.

SYNTHEISIS. See Analysis.

SYPHILIS, a disease usually communicated by impure sexual connection. It is a contagious and hereditary venereal disease, characterized in its primary or local stage by chancres or ulcers on the genitals, succeeded by inguinal buboes. The indications of a secondary or constitutional affection are ulcers in the throat, copper-colored eruptions on the skin, pains in the bones, nerves, etc. During the latter part of the 15th century it assumed an epidemic form, and spread throughout the whole of Europe. Like other diseases, it gradually diminished in virulence, particularly after Paracelsus had found in mercury a useful remedy against it.

SYPHON. See Siphon.

SYRACUSE (now Siracusa), anciently the chief city of Sicily, on the east coast of the island, one of the most magnificent cities in the world, with 500,000 inhabitants, is now greatly reduced, but still has an excellent harbor, capable of receiving vessels of the greatest burden. The cathedral is the ancient temple of Minerva, and there are remains of amphitheatres and other Roman works. Syracuse was founded by a colony of Corinthians under Archias, B.C. 734, and, according to Thucydides, possessed a greater population than Athens or any other Grecian city. Syracuse is the seat of an archbishop, and since 1865 has been the capital of a province of the same name. It has some manufactures of drugs, chemicals, and earthenware,

and a considerable commerce, principally in wine. Pop. 21,157.

SYR'ACUSE, a city in Onondaga co., New York, 148 miles west of Albany. It has spacious and well-built streets, handsome churches, splendid hotels, large and lofty warehouses, university, and complete system of public schools, etc. The salt industry, to which it owed its early prosperity, is still the staple, the springs yielding on an average from seven to eight million bushels of salt a year; but the other industries are numerous and important (including rolling-mills, furnaces, steel works, etc.), and there is an extensive traffic by rail and canal. Pop. 1909, about 130,000.

SYRACUSE UNIVERSITY, a coeducational institution at Syracuse, N. Y.; founded in the year 1848, but located at Lima, N. Y., and known as Genesee college until 1871, when it was removed to Syracuse. The campus comprises 50 acres; the principal buildings are the Hall of Languages, the Holden observatory, the John Crouse Memorial college, containing the college of fine arts,

terranean; area, estimated at about 70,000 square miles. The coast has some low sandy tracts, but is in general, though not deeply indented, lofty and precipitous, rising, particularly in Mount Carmel, to the height of 3000 feet. The only good harbors are those of Beyrout and Alexandretta (Scanderoon). In Lebanon the mountains reach a height of about 10,000 feet. Between the two parallel ranges of Libanus and Anti-Libanus is the valley of Cœle-Syria, whence the Orontes flows northward, turning westward at Antioch, and falling into the sea at the ancient Seleucia. The principal river of South Syria (Palestine, which see) is the Jordan. In the course of the Jordan are the lakes of Merom and Tiberias, and at its mouth is the far larger lake, the Dead Sea. Much of the soil, more especially in the valleys of Lebanon, is very fertile; but agriculture is not pursued with so much zeal as in ancient times. Nevertheless, the orchards of Damascus and the corn-fields of Hauran are celebrated, and the olive-tree and the vine are found in all

elements. The Mohammedans comprise about four-fifths of the population, and the Christians one-fifth. Syria at an early period became part of the Assyrian empire, and afterward passed to the Persians, the Greeks and the Romans. It formed part of the Byzantine empire, but was taken by the Arabs in 636, by the Seljuk Turks in 1078, by the Crusaders, whose kingdom of Jerusalem lasted till 1295, by the Mamelukes, who united it with Egypt, and by the Ottoman Turks, who added it to their empire in 1517. The most important events in the modern history of Syria are its conquest by Mehemet Ali of Egypt in 1833, and its restoration to Turkey in 1840 by the intervention of the great European powers; and the war between the Druses and Maronites which broke out in 1860, peace being restored in 1861 only by the active efforts of a French force sent out under sanction of Turkey and the western powers. At present Syria comprises three vilayets—Syria proper, Aleppo, and Beyrout, and the mutessarifates of Zor (on the Euphrates) Lebanon, and Jerusalem. Lebanon has the special privilege of being under the rule of a Christian Mutessarif.

SYRINGA. See Lilac.

SYRINGE, an instrument consisting of a cylinder of metal or glass fitted with an air-tight piston, which is moved up and down by means of a handle. In its simplest form it is destitute of valves, one simple aperture at the extremity serving for the admission and ejection of fluid; those provided with valves, however, are available, on a small scale, for all the purposes of an air-pump.

SYRUP, in medicine, a saturated, or almost saturated solution of sugar in water, either simple, flavored, or medicated. In the sugar manufacture, a syrup is a strong saccharine solution which contains sugar in a condition capable of being crystallized out, the ultimate uncrystallizable fluid being called treacle or molasses.

SZE-CHUEN, a large province in the west of China; area, 166,800 sq. miles. The surface is generally rugged and full of defiles, especially in the west, where many peaks rise far above the snow-line, but there is a plain of some extent surrounding Ching-too-fo, the capital. The principal river is the Yang-tse-kiang. The soil is only moderately fertile, but there is some metallic wealth. Pop. 67,712,897.

SZEGEDIN (seg'e-din), a royal free city of Hungary. It is second only to Budapest, and is a great center of commerce and agriculture. Pop. 100,552



Antioch in Syria.

the library building, and the Y. M. C. A. hall and gymnasium. The medical college building is near the center of the city. The college was removed from Geneva in 1881. A college of law was opened in 1895.

SYR'IA, a country forming part of Asiatic Turkey, and bounded on the north by the Taurus range, on the northeast by the Euphrates, on the east by the Syrian desert, on the south and southeast by Arabia, on the southwest by Egypt, and on the west by the Medi-

parts. The country is poor in minerals; the native manufactures in silk, cotton, and wool have been paralyzed by the import trade from Europe; and the caravan trade has almost entirely ceased. The inhabitants, roughly estimated at about 1,500,000, consist chiefly of two elements, the Aramaic and the Arabic the latter including Bedouins and town and peasant Arabs. Jews are found only in the large towns, and have immigrated back from Europe. The language generally spoken is Arabic, but with Aramaic

T

T, the twentieth letter in the English alphabet, a sharp mute consonant, representing the sound produced by a quick and strong emission of the breath after the end of the tongue has been placed against the roof of the mouth near the roots of the upper teeth. By Grimm's law *t* in English corresponds to *d* in Latin, Greek, and Sanskrit, and to *ss* or *z* in German.

TAB'ARD, a sort of tunic of the middle ages, worn over the armor, and generally embroidered with the arms of the wearer or if worn by a herald, with those of his lord or sovereign. It still forms a part of the official dress of heralds.

TABAS'CO, a state of Mexico, between Yucatan peninsula and Vera Cruz; area, 12,716 sq. miles. A large portion of the state is still covered with

primeval forests. The inhabitants are chiefly Indians. The capital is San-Juan-Bautista. Pop., 158,107.

TABERNACLE, in Jewish antiquities, the tent or sanctuary in which the sacred utensils were kept during the wanderings of the Israelites in the desert. It was in the shape of a parallelogram, 45 feet by 15, and 15 feet in height, with its smaller ends placed east and west, and

having its entrance in the east. Its framework consisted of forty-eight gilded boards of shittim-wood, bound together by golden rings and set into silver sockets; and this framework was covered with four carpets. The interior was divided by a curtain into two compartments, the outer the "sanctuary" proper, and the innermost the holy of holies. In the sanctuary was placed on the north the table of show-bread, on the south the golden candle-stick, and in the middle, near the inner curtain, the altar of incense. In the center of the holy of holies stood the ark of the covenant. The tabernacle was situated in a court 150 feet by 75, surrounded by costly screens 7½ feet high, and supported by pillars of brass 7½ feet apart, to which the curtains were attached by hooks and fillets of silver. In the outer or eastern half of the court stood the altar of burnt-offering, and between it and the tabernacle itself the laver, at which the priests washed their hands and feet before entering the sanctuary. It was superseded by the temple at Jerusalem.



Tabard, Sir John Cornwall, Ampthill church, Beds.

TABERNACLES, Feast of, the last of the three great festivals of the Jews which required the presence of all the males in Jerusalem. Its object was to commemorate the dwelling of the Israelites in tents during their sojourn in the wilderness, and it was also a feast of thanksgiving for the harvest and vintage. The time of the festival fell in the autumn, when all the chief fruits were gathered in, and hence it is often called the feast of the ingathering. Its duration was strictly only seven days, but it was followed by a day of holy convocation of peculiar solemnity. During the seven days the people lived in booths erected in the courts of houses, on the roofs, and in the court of the temple. It was the most joyous festival of the year.

TABLE-LAND, or **PLATEAU**, a flat or comparatively level tract of land considerably elevated above the general surface of a country. Being in effect broad mountain masses, many of these plateaux form the gathering-grounds and sources of some of the noblest rivers, while their elevation confers on them a climate and a vegetable and animal life distinct from that of the surrounding lowlands. In Europe the chief tablelands are that of Central Spain, the less-defined upland in Switzerland, and the

lower plateaux of Bavaria and Bohemia. In Asia are the most extensive tablelands in the world; the sandy rainless Desert of Gobi, nearly 400,000 sq. miles; and the loftiest inhabited table-land in the world, that of Tibet, with an elevation of from 11,000 to 15,000 feet. In Africa are the plateaux of Abyssinia, and the karoos or terrace plains of South Africa. In America the great tablelands are those of Mexico and the Andes.

TABOO', or **TABU**, a peculiar institution formerly prevalent among the South Sea islanders, and used in both a good and bad sense—as something sacred or consecrated, and as something accursed or unholy—both senses forbidding the touching or use of the thing taboo. The idea of prohibition was always prominent. The whole religious, political, and social system of the primitive Polynesians was enforced by the taboo, the infringement of which in serious cases was death.

TABREEZ', or **TABRIZ'**, a city of Persia, capital of the province of Azerbaijan, on the Aigi, 36 miles above its entrance into Lake Urumia. Tabreez has manufactures of silks, cottons, carpets, leather and leather goods, etc. It is the great emporium for the trade of Persia on the west, and has an extensive commerce. It has frequently suffered from earthquakes. Pop. 170,000.

TACAHOUT (tak'a-hut), the small gall formed on the tamarisk-tree. It is imported for the sake of its gallic acid, and is used as a mordant in dyeing and in tanning.

TACAMAHAC', the name given to a bitter balsamic resin, the produce of several kinds of trees belonging to Mexico and the West Indies, the East Indies, South America, and North America. The balsam-poplar or tacamahac is one of these.

TACITUS, Caius Cornelius, a Roman historian, born probably about 54 A.D. Under Titus he became quæstor or ædile; was prætor under Domitian (A.D. 88), and consul under Nerva (A.D. 97). He was several years absent from Rome on provincial business, and probably then made the acquaintance of the German peoples. The time of his death is uncertain; but it probably took place after A.D. 117. We have four historical works from his pen; his *Annals*, in sixteen books (of which books seventh to tenth inclusive are lost), which contain an account of the principal events in Roman history from the death of Augustus (A.D. 14) to that of Nero (A.D. 68); his *History* (of which only four books and a part of the fifth are extant), which begins with the year 69 A.D., when Galba wore the purple, and ends with the accession of Vespasian (70); his *Germany*, an account of the geography, manners, etc., of the country; and his *Life of Agricola*. The works of Tacitus have been pronounced, by the unanimous voice of his contemporaries and of posterity, to be masterpieces in their way.

TACK, in navigation, the course of a ship in regard to the position of her sails and the angle at which the wind strikes them. Tacking is an operation by which a ship is enabled to beat up against a wind by a series of zigzags, the sails be-

ing turned obliquely to the wind first on one side and then on the other.

TACO'MA, a town in the state of Washington, on Commencement bay, Puget sound, the western terminus of the North Pacific railroad, with railway works, salmon-canning, lumber trade, etc. Pop. 1909, about 110,000.

TACONIC MOUNTAINS, a range of mountains in the United States, connecting the Green mountains of Western Massachusetts with the highlands of the Hudson. The "Taconic System," in geology, was named from the characteristic strata of this range, a metamorphic rock, believed to be older than the Silurian system.

TAD'EMA. See Alma-Tadema.

TADPOLE, the name given to the larval or young state of frogs and other amphibians.

TAFF'ETA, or **TAFFETY**, was originally the name applied to all kinds of plain silks, but which has now become a kind of generic name for plain silk, gros de Naples, gros des Indes, shot silk, glacé, and others. The term has also been applied to mixed fabrics of silk and wool.

TAFFRAIL, or **TAFFEREL**, a curved wooden rail running from one quarter-stanchion to the other of a ship's stern, and usually ornamented with some device in sculpture.

TAFT, William Howard, an American jurist and administrator, was born in Cincinnati in 1857. He was a judge of the superior court of Ohio, 1887-1890, solicitor-general of the United States, 1890-92, and judge of the United States circuit court 1892-1900, when he resigned to become chairman of the commission appointed to establish civil government in the Philippines. He was appointed in 1901 the first civil governor of the islands. In 1903 he became secretary of war. In 1908 he was nominated for the presidency and was elected by an overwhelming majority.

TAGANROG, a seaport of Russia, in the government of Ekaterinoslav, on a low cape on the northern shore of the Sea of Azof. The chief article of export is corn. Pop. 56,047.

TAGLIONI (tál-yó'nē), Marie, ballet dancer, born 1809, was trained by her father, an Italian master of the ballet; appeared at Vienna in 1822, at Paris in 1827, and at London, where she created a great sensation, in 1838. She visited all the capitals of Europe, and was acknowledged the first ballet dancer of her time. She died at Marseilles in 1884.

TAGUS, the largest river of Spain and Portugal. It has a total length of 540 miles, and is navigable for 115 miles.

TAHITI (tá-hē'ti), the largest of the Society islands, consisting of two peninsulas, connected by an isthmus 3 miles broad, and submerged at high-water; area, 412 sq. miles. It is hilly, volcanic, beautiful, and highly fertile; and produces sugar, cocoa-nut, arrow-root, dye-woods, etc. The chief town is Papeete, which has an excellent harbor. Pop. of the island, 10,639. See Society islands.

TAILOR-BIRD, a bird so named from its curious habits of weaving or sewing together leaves in order to form a nest. It belongs to the sub-family of true

warblers, and inhabits India and the Eastern archipelago.



A Tahitian family.

TAINE (tān), Hippolyte Adolphe, French writer, born at Vouziers (Ardennes) in 1828. In 1854 his first work, an *Essay on Livy*, was crowned by the academy; in 1864 he was appointed professor in the School of Fine Arts in Paris; and in 1878 he was elected to a seat in the academy. His *History of English Literature*, one of the best and most philosophical works on the subject, appeared in 1864; his *Philosophy of Art* in 1865; his *Notes on England* in 1872; and his *Origins of Contemporary France* in 1875-94, a work of great research and value, in three sections, dealing respectively with the Ancient Régime the Revolution, and the Modern Régime. He died in 1893.

TAIWAN (ti-wān'), capital of the Japanese island Formosa, one of the treaty ports, with considerable trade in sugar and opium. Pop., including Takow, which almost forms one city with it, 235,000.

TALC, a magnesian mineral, consisting of broad, flat, smooth laminæ or plates, unctuous to the touch, of a shining luster, translucent, and often transparent when in very thin plates. There are three principal varieties of talc, common, earthy, and indurated. Talc is a silicate of magnesium, with small quantities of potash, alumina, oxide of iron, and water. It is used in many parts of India and China, as a substitute for window-glass. A variety of talc called French chalk (or steatite) is used for tracing lines on wood, cloth, etc., instead of chalk. See Potstone, Soap stone, Steatite.

TALCA, a town of Chile, capital of the province of Talca, on the Claro, is connected by rail with Santiago, and has manufactures of ponchos. Pop. 42,625. The province has an area of 3664 sq. miles, and pop. 128,961.

TALENT, the name of a weight and denomination of money among the ancient Greeks, and also applied by Greek writers to various standard weights and denominations of money of different na-

tions; the weight and value differing in the various nations and at various times. The Attic talent as a weight contained 60 Attic minæ or 6000 Attic drachmæ, equal to 56 lbs. 11 oz. troy weight. As a denomination of silver money it was equal to \$1,215. The great talent of the Romans is computed to be equal to \$500, and the little talent to \$375. A Hebrew weight and denomination of money, equivalent to 3000 shekels, also receives this name. As a weight it was equal to about 93½ lbs. avoirdupois; as a denomination of silver it has been variously estimated at from \$1700 to \$2000.

TALIPOT PALM, the great fan-palm, a native of Ceylon. The cylindrical trunk reaches a height of 60, 70, or 100 feet, and is covered with a tuft of fan-like leaves, usually about 18 feet in length and 14 in breadth. The leaves are used for covering houses, for making umbrellas and fans, and as a substitute for paper. When the tree has attained



Talipot palm.

its full growth, the flower spike bursts from its envelope or spathe with a loud report. The flower spike is then as white as ivory, and occasionally 30 feet long. When its fruit is matured, the tree generally dies.

TALISMAN, a figure cast or cut in metal or stone, and made, with certain superstitious ceremonies, at some particular moment of time, as when a certain star is at its culminating point, or when certain planets are in conjunction. The talisman thus prepared is supposed to exercise extraordinary influences over the bearer, particularly in averting disease. In a more extensive sense the word is used, like amulet, to denote any object of nature or art, the presence of which checks the power of spirits or demons, and defends the wearer from their malice. Relics, consecrated candles, rosaries, images of saints, etc., were employed as talismans in the middle ages; and at that time the knowledge of the virtues of talismans and amulets formed an important part of medical science.

TALLEGALLA, or **BRUSH TURKEY**, a remarkable genus of rasorial birds, usually designated by the distinctive name of "brush turkey." It inhabits

Australia, where it is also known by the names "wattled tallegalla" and "New Holland vulture"—this latter name having reference to the naked vulturine head and neck. The male when full grown is colored of a blackish-brown above and below, with grayish tints on the back. The head and neck are covered with very small feathers of blackish hue, while a large wattle, colored bright or orange yellow, depends from the front of the neck. These birds are remarkable on account of the huge, conical "egg-mound" which they form, several of them jointly, for the purpose of therein depositing their eggs, which are hatched by the heat of the decomposing mass of vegetable matter piled up. The eggs are greatly sought after on account of their delicious flavor.

TALLEYRAND-PERIGORD (tāl-ā-rān-pā-rē-gōr), Charles Maurice de, Prince of Benevento, French diplomatist, was born at Paris in 1754, died there in 1838. His high birth and great ability procured him rapid advancement, and in 1788 he was consecrated bishop of Autun. In 1790 he was elected president of the national assembly. In 1792 he was sent to London charged with diplomatic functions, and during his stay there was proscribed for alleged royalist intrigues. Forced to leave England by the provisions of the Alien Act, in 1794 he sailed for the United States, but returned to France in 1796. The following year he was appointed minister of foreign affairs; but being suspected of keeping up an understanding with the agents of Louis XVIII. he was obliged to resign in July, 1799. He now devoted himself entirely to Bonaparte, whom he had early recognized as the master spirit of the time, and after Bonaparte's return



Talleyrand.

from Egypt contributed greatly to the events of the 18th Brumaire (10th November, 1799), when the directory fell and the consulate began. He was then reappointed minister of foreign affairs. After the establishment of the empire in 1804 he was appointed to the office of grand-chamberlain, and in 1806 was created Prince of Benevento. After the Peace of Tilsit in 1807 a coolness took place between him and Napoleon, and became more and more marked. In 1808 he secretly joined a royalist committee. In 1814 he procured Napoleon's abdication. He took part in the congress of Vienna, and in 1815, when the allies

again entered Paris, he became president of the council with the portfolio of foreign affairs; but as he objected to sign the second Peace of Paris he gave in his resignation. When the revolution of July, 1830, broke out, he advised Louis Philippe to place himself at its head and to accept the throne. He crowned his career by the formation of the Quadruple Alliance.

TALLIEN (tál-i-an), Jean Lambert, French revolutionist, was born at Paris in 1769, and first made himself known by publishing a revolutionary journal called *Ami du Citoyen*. He soon became one of the most popular men of the revolutionary party, and took part in most of the sanguinary proceedings which occurred during the ascendancy of Robespierre. After the fall of Danton and his party he perceived that he should become one of the next victims of Robespierre if he did not strike the first blow, and it was mainly by his influence that the latter with his friends was brought to the guillotine. He subsequently became a member of the Council of Five Hundred, but his influence gradually declined. In after years he was glad to accept the office of French consul at Alicante. He died at Paris, in poverty and obscurity, in 1820.

TALLOW, the harder and less fusible fat of animals, especially cattle and sheep, melted and separated from the fibrous matter mixed with them. Tallow is firm, brittle, and has a peculiar heavy odor. When pure it is white and nearly insipid; but the tallow of commerce has usually a yellowish tinge, which may be removed by exposure to light and air. Tallow is manufactured into candles and soap, and is extensively used in the dressing of leather, and in various processes of the arts. The British imports of tallow are chiefly from Australia and the United States. Vegetable tallow is contained in the seeds of various plants, one of the best known of which is the candle-berry. See also China Wax, and next article.

TALLOW-TREE, one of the largest, the most beautiful, and the most widely diffused of the plants found in China. From a remote period it has furnished the Chinese with the material out of which they make candles. The capsules and seeds are crushed together and boiled; the fatty matter is skimmed as it rises, and condenses on cooling. The tallow-tree has been introduced into the United States, and is almost naturalized in the maritime parts of Carolina. It has also been acclimatized by the French in Algeria.

TALLY, a piece of wood on which notches or scores are cut, as the marks of number. In purchasing and selling it was once customary for traders to have two sticks, or one stick cleft into two parts, and to mark with scores or notches on each the number or quantity of goods delivered, or what was due between debtor and creditor, the seller or creditor keeping one stick, and the purchaser or debtor the other. Before the use of writing, or before writing became general, this or something like it was the usual method of keeping accounts. In the exchequer of England tallies were used till late in the 18th century.

TALMAGE, Thomas DeWitt, clergyman, born in Bound Brook, N. J., in 1832. His first pastorate was at Belleville, N. J., in the Presbyterian church. In 1859 he went to Syracuse, N. Y., and in 1862 became located in Philadelphia, Penn. There he remained seven years, when he was called to the pastorate of the Central Presbyterian church in Brooklyn, N. Y. He acquired a national reputation for effective but rather sensational pulpit oratory. His congregation built him a church in 1870, having a seating capacity of 3,400, which was called the Brooklyn tabernacle. It was destroyed by fire in 1872 and in 1874 a new tabernacle was dedicated with a seating capacity of 5,000. This edifice was also burned in the early spring of 1890, when the church organization ceased to exist. His wide influence was largely increased by frequent lecturing tours, both in America and England. He was editor of *The Christian at Work*, *The Advance*, *Frank Leslie's Sunday Magazine*, and *The Christian Herald*. He died in 1902.

TALMUD, a Chaldaic word signifying "doctrine," and sometimes used to designate the whole teaching of the Jewish law, comprising all the writings included in what we call the Old Testament, as well as the oral law or Mishna, with its supplement or commentary the Gemara, but more frequently applied only to the Mishna and Gemara. The Gemara was originally an oral commentary of the Mishna, as the Mishna itself was originally an oral commentary of the Mikra, or written law. It consisted of the explanations and illustrations which the teachers of the Mishna were in the habit of giving in the course of their lessons. These oral comments, were handed down from age to age, differing of course in different localities and gradually increasing in quantity; and they were at last committed to writing in two forms, the one called the Jerusalem and the other the Babylonian Gemara, or, with the addition of the Mishna, which is common to both, the Jerusalem and the Babylonian Talmud. The Jerusalem Talmud is the earlier and by much the smaller of the two. The language of both the Gemaras is a mixed Hebrew, but that of the Babylonian Gemara is much less pure than the other; in the narrative portions, designed as popular illustrations of the other parts, it comes near the Aramaic or vernacular dialect of the Eastern Jews. The style is in both cases extremely condensed and difficult. The Mishna, with its corresponding Gemara, is divided into six orders or principal divisions. The subjects of these orders are agriculture, festivals, women, damages, holy things, and purifications. These orders are subdivided into sixty-three tracts, to which the Babylonian Gemara adds five others, thus containing sixty-eight tracts in all. Other divisions of the Talmud are the Halaka, the doctrinal and logical portion; Hagada, the rhetorical or imaginative portion; and Cabala, the mystical portion, including theosophy and magic. Many translations of parts of the Talmud have appeared.

TAM'ARACK. See Larch.

TAM'ARIN, the name of certain South

American monkeys. The tamarins are active, restless, and irritable little creatures, two of the smallest being the silky tamarin and the little lion monkey the latter of which, though only a few inches in length, presents a wonderful resemblance to the lion.

TAM'ARIND, a large and beautiful tree of the East and West Indies. It is cultivated chiefly for the sake of its pods (tamarinds). The West Indian tamarinds are put into casks, with



Tamarind.

layers of sugar between them, or with boiling syrup poured over them, and are called prepared tamarinds. The East Indian tamarinds, which are most esteemed, are preserved without sugar. They are dried in the sun, or artificially with salt added.

TAMAULIPAS (tá-mou-lé'pás), a state of Mexico, on the Gulf of Mexico, north of Vera Cruz; area, 28,659 sq. miles. The capital is Ciudad Victoria. Pop. 218,948.

TAMBOURINE (tam-bu-rēn'), a musical instrument of the drum species, much used among the Spanish and Italian peasants as well as elsewhere. It consists of a piece of parchment stretched



Spanish tambourine.

over the top of a broad hoop, which is furnished with little bells. It is sounded by sliding the fingers along the parchment, or by striking it with the back of the hand or with the fist or the elbow.

TAMBOV, a government of Russia, south of Nijni-Novgorod and Vladimir, between the basins of the Oka and the Don; area, 25,676 sq. miles. It is one of the largest, most fertile, and most densely peopled provinces of Central Russia. Pop. 2,607,881.—Tambov, the capital, 263 miles southeast of Moscow,

has great trade in corn and cattle. Pop. 35,688.

TAMERLANE. See Timour.

TAMMANY RING, a political combination of New York, which, about 1870, under William M. Tweed, secured the control of the elections in that city and the management of the municipal revenues, which were extensively plundered. The frauds, amounting to many millions of dollars, were discovered in 1876. The name Tammany was given from the meeting-place, Tammany hall, New York, being originally the name of a celebrated Indian chief. See Tweed, W. M.

TAMPA, a port of Florida, Hillsboro co., on the Gulf coast; a rising business center, the terminus of two railways, and the point of departure of steamers for Key West, Havana, and the ports along the coast of Florida. Pop. 18,160.

TAMSUI, a seaport of the island of Formosa, one of the treaty ports, with a trade in tea. Pop. 95,000.

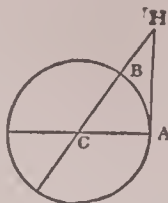
TAN'AGERS, passerine birds, or finches, distinguished by the bill being of triangular shape at its base and arched toward its tip, and remarkable for their bright colors. They are chiefly found in the tropical parts of America.

TANEY (ta'nī), Roger Brooke, eminent American jurist, chief justice of the United States supreme court, was born in Calvert co., Md., in 1777. In 1823 he removed to Baltimore. In 1827 he was elected attorney-general of the state and was appointed attorney-general of the United States in 1831. In 1836 he succeeded John Marshall as chief justice of the United States supreme court. He wrote the opinion of the court in many important cases, the most notable being that of Dred Scott. A memoir of Taney's life, in part an autobiography, was published in 1872 by Samuel Tyler. He died in 1864.

TANCRED, son of the Marquis Odo the Good and Emma the sister of Robert Guiscard, born in 1078, was one of the most famous heroes of the first Crusade. He distinguished himself at the siege of Nicæa (1097), at the battle of Dorylæum (July, 1097), at the capture of Jerusalem (July, 1099), and at Ascalon (August 12), and was appointed by Godfrey de Bouillon Prince of Galilee. He died in 1112, in his thirty-fifth year, of a wound received at Antioch. He is represented by Tasso in the Jerusalem Delivered as the flower and pattern of chivalry.

TANGENT, in geometry, a straight line which touches or meets a circle or curve in one point, and which being produced does not cut it; a straight line drawn at right angles to the diameter of a circle, from the extremity of it, as *h* in figure, which being continued at *a*, would merely touch and not cut the circle. In trigonometry the tangent of an arc is a straight line touching the circle of which the arc is a part, at one extremity of the arc, and meeting the diameter passing through the other extremity. Thus *a h* is the tangent of the arc *a b*, and it is also said to be the tangent of the angle *a c b*, of which *a b* is the measure. The arc and its tangent have always a certain relation to each other; and when the one is given in parts

of the radius, the other can always be computed. For trigonometrical purposes tangents for every arc from 0 degrees to 90 degrees, as well as sines, cosines, etc., have been calculated with reference to a radius of a certain length,



Tangent.

and these or their logarithms formed into tables. In the higher geometry the word tangent is not limited to straight lines, but is also applied to curves in contact with other curves, and also to surfaces.

TANGIER (tan'jēr), a seaport of Morocco, on the Strait of Gibraltar. In 1662 Tangier was annexed to the English crown as part of the dowry of the Infanta of Portugal, the wife of King Charles II., but in 1864 it was abandoned, on account of the expense necessary to keep it up. Pop. estimated at 20,000.

TANGLE, the common name of two species of sea-weed found on the shores of Britain, *Laminaria digitata* and *Laminaria saccharina*.

TANJORE, a city in Hindustan, in the presidency of Madras, capital of the district of the same name. Manufactures of silk, muslin, and cotton are carried on to a considerable extent. Pop. 57,605.—The district of Tanjore has an area of 3654 sq. miles, and a population of 2,130,383.

TANNHAUSER (tân'hoi-zēr), or **TAN-HAUSER**, in old German legend, a knight who gains admission into a hill called the Veunsberg, in the interior of which Venus holds her court, and who for a long time remains buried in sensual pleasures, but at last listens to the voice of the Virgin Mary, whom he hears calling upon him to return. The goddess allows him to depart, when he hastens to Rome to seek from the pope (Pope Urban) absolution for his sins. The pope, however, when he knows the extent of the knight's guilt, declares to him that it is as impossible for him to obtain pardon as it is for the wand which he holds in his hand to bud and bring forth green leaves. Despairing, the knight retires from the presence of the pontiff, and enters the Venusberg once more. Meanwhile the pope's wand actually begins to sprout, and the pope, taking this as a sign from God that there was still an opportunity of salvation for the knight, hastily sends messengers into all lands to seek for him. But Tannhäuser is never again seen. The Tannhäuser legend has been treated poetically by Tieck, and Richard Wagner has adopted it (with modifications) as the subject of one of his operas.

TANNIC ACID, or **TANNIN**, a peculiar acid which exists in every part of all species of oaks, especially in the bark, but is found in greatest quantity in gall-nuts. Tannic acid, when pure, is nearly white, and not at all crystalline. It is

very soluble in water, and has a most astringent taste, without bitterness. It derives its name from its property of combining with the skins of animals and converting them into leather, or tanning them. It is the active principle in almost all astringent vegetables, and is used in medicine in preference to mineral astringents, because free from irritant and poisonous action. The name is generally applied to a mixture of several substances.

TANNING, the operation of converting the raw hides and skins of animals into leather by effecting a chemical combination between the gelatine of which they principally consist and the astringent vegetable principle called tannic acid or tannin. The object of the tanning process is to produce such a chemical change in skins as may render them unalterable by those agents which tend to decompose them in their natural state, and in connection with the subsequent operations of currying or dressing to bring them into a state of pliability and impermeability to water which may adapt them for the many useful purposes to which leather is applied. The larger and heavier skins subjected to the tanning process, as those of buffaloes, bulls, oxen, and cows, are technically called hides; while those of smaller animals, as calves, sheep, and goats, are called skins. In preparing the hides and skins for tanning they are subjected to certain operations already described under Leather, after which the tanning proper begins. The various substances used for tanning are oak, fir, mimosa, and hemlock bark, sumach, myrobalans, divi-divi, valonia-nuts, cutch, kino, gambir, and oak-galls—all of which contain tannin. The impregnation of the hides with this tannin may be effected either by placing them between layers of bark (oak bark being the best) in a vat filled with water, or steeping them in a liquor containing a small at first, but steadily increasing proportion of tannin throughout a series of pits. This liquor usually consists of water in which the ground or crushed tanning material has been steeped. The raw hide takes about a year to prepare it for the best quality of leather. There is also a process called tawing, which is employed chiefly in the preparation of the skins of sheep, lambs, goats, and kids. In this process the skins are steeped in a bath of alum, salt, and other substances, and they are also sometimes soaked in fish-oil. The more delicate leathers are treated in this manner, those especially which are used for wash leathers, kid gloves, etc. After the leather is tanned it is finished for use by the process of currying. Various improvements have been attempted to be made in the art of tanning, such as the preparation of the skins by means of metallic solutions instead of by vegetable tan-liquor; the forced absorption of the tan by applying pressure between cylinders; and the preparation of the skins by a chemical agent, so as to induce a quicker absorption of the tan. It has been found, however, that the slow process followed by the old tanners produces leather far superior to that produced by the new and more rapid

methods, though a fair leather for certain purposes may be produced in five to ten weeks.

TANSY is a well-known plant. It is a tall plant, with divided leaves and button-like heads of yellow flowers. Every part of the plant is bitter, and it is considered as tonic and anthelmintic, tansy-



Tansy.

a, A disk-flower; b, A ray-flower; c, An achene.

tea being an old popular medicine. It is now cultivated in gardens mainly for the young leaves, which are shredded down and employed to flavor puddings, cakes, etc.

TANTA, a town of Lower Egypt, situated on the railway about 50 miles n. of Cairo. Tanta has three great annual fairs, which are held in January, April, and August, and at the latter 500,000 persons are said to congregate from the surrounding countries. Pop. 60,000.

TAN'TALUS, in Greek mythology, a son of Zeus, and king of Phrygia, Lydia, Argos or Corinth, who was admitted to the table of the gods, but who had forfeited their favor either by betraying their secrets, stealing ambrosia from heaven, or presenting to them his murdered son Pelops as food. His punishment consisted in being placed in a lake whose waters receded from his lips when he attempted to drink, and of being tempted by delicious fruit overhead which withdrew when he attempted to eat. Moreover, a huge rock forever threatened to fall and crush him.

TAN'TALUS, a genus of wading birds of the heron family. It is the wood-ibis of America, which frequents extensive swamps, where it feeds on serpents, young alligators, frogs, and other reptiles. The African tantalus was long regarded as the ancient Egyptian ibis, but it is rare in Egypt, belonging chiefly to Senegal, and is much larger than the true ibis.

TA'PESTRY, a kind of woven hangings of wool and silk, often enriched with gold and silver, with worked designs, representing figures of men, animals, landscapes, etc., and formerly much used for lining or covering the walls and furniture of apartments, churches, etc. Tapestry is made by a process intermediate between weaving and embroidery, being worked in a web with needles instead of a shuttle. Short lengths of thread of the special colors

required for the design are worked in at the necessary places and fastened at the back of the texture. In Flanders, particularly at Arras (whence the term arras, signifying the "tapestry"), during the 15th and 16th centuries, the art was practiced with uncommon skill. The art of weaving tapestry was introduced into England near the end of Henry VIII.'s reign. During the reign of James I. a manufactory was established at



Fire-screen, covered with tapestry.

Mortlake, which continued till the beginning of the 18th century. The term tapestry is also applied to a variety of woven fabrics having a multiplicity of colors in their design, which, however, have no other characteristic of true tapestry. The name of tapestry carpet is given to a showy and cheap two-ply or ingrain-carpet, the warp or weft being printed before weaving so as to produce the figure in the cloth.

TAPE-WORMS, the name common to certain internal parasites (Entozoa), found in the mature state in the alimentary canal of warm-blooded vertebrates. Tape-worms are composed of a number of flattened joints or segments, the anterior of which, or head (which is the true animal), is furnished with a circlet of hooks or suckers, which enable it to maintain its hold on the mucous membrane of the intestines of its host. The other segments, called proglottides, are simply generative organs budded off by the head, the oldest being furthest removed from it, and each containing when mature male and female organs. The tape-worm has neither mouth nor digestive organs, nutrition being effected by absorption through the skin. The length of the animal varies from a few inches to several yards. The ova do not undergo development in the animal in which the adult exists. They require to be swallowed by some other warm-blooded vertebrate, the ripe proglottides being expelled from the bowel of the host with all their contained ova fertilized. The segments or proglottides decompose and liberate the ova, which are covered with a capsule. After being swallowed the capsule bursts and an embryo, called a prosclex, is liberated. This embryo, by means of spines, perforates the tis-

sucs of some contiguous organ, or of a blood-vessel, in the latter case being carried by the blood to some solid part of the body, as the liver or brain, where it surrounds itself with a cyst, and develops a vesicle containing a fluid. It is now called a scolex or hydatid, and formerly was known as the cystic worm. The scolex is incapable of further development till swallowed and received a second time into the alimentary canal of a warm-blooded vertebrate. Here it becomes the head of the true tape-worm, from which proglottides are developed posteriorly by gemination, and we have the adult animal with which the cycle begins. In all cases the only conclusive sign of tape-worm is the passage of one or part of one in the fæces. One mode of treatment for this disorder is, for an adult, a tea-spoonful of the extract of male-fern. A few hours thereafter a strong dose of castor-oil should be taken.

TAPIO'CA, a farinaceous substance prepared from cassava meal, which, while moist or damp, has been heated for the purpose of drying it on hot plates. By this treatment the starch-grains swell, many of them bust, and the whole agglomerates in small irregular masses or lumps. In boiling-water it swells up and forms a viscous jelly-like mass. See Cassava.

TAPIR, the name of ungulate or hoofed animals. The nose resembles a short fleshy proboscis; there are four toes to the fore-feet, and three to the hind ones. The common South American tapir is the size of a small ass, with a brown skin, nearly naked. It inhabits forests, lives much in the water, conceals itself during the day, and feeds on vegetable substances. There are several other American species. The *T. malayanus* or *indicus* is found in the forests of Malacca and Sumatra. It is



Malay tapir.

larger than the American species, and is a most conspicuous animal from the white back, rump, and belly contrasting so strongly with the deep sooty black of the rest of the body as, at a little distance, to give it the aspect of being muffled up in a white sheet. Fossil tapirs are scattered throughout Europe, and among them is a gigantic species, *T. giganteus*, Cuvier, which in size must have nearly equalled the elephant.

TAR, a thick, dark-colored, viscid product obtained by the destructive distillation of organic substances and bituminous minerals, as wood, coal, peat, shale, etc. Wood-tar, such as the Archangel, Stockholm, and American tars of commerce, is obtained by burning billets of wood slowly in a conical cavity at the bottom of which is a cast-iron pan into which the tar exudes. In Britain wood-tar is chiefly obtained as a

TARAI

by-product in the destructive distillation of wood for the manufacture of wood-vinegar (pyroligneous acid) and wood-spirit (methyl alcohol). It has an acid reaction, and contains various liquid matters, of which the principal are methyl-acetate, acetone, hydrocarbons of the benzene series, and a number of oxidized compounds, as carboic acid. Paraffin, anthracene, naphthalene, chrysene, etc., are found among its solid products. It possesses valuable antiseptic properties, owing to the creasote it contains, and is used extensively for coating and preserving timber, iron, and cordage. Coal-tar, which is largely obtained in gas manufacture, is also valuable inasmuch as it is extensively employed in the production of dyes, etc. See Coal-tar and Aniline.

TARAI (ta-ri'; "moist land"), a moist and jungly tract of Northern India, running along the foot of the first range of the Himalayas for several hundred miles, with a breadth of from 2 to 15, infested by wild beasts, and generally unhealthy. Area, 938 sq. miles; pop. 206,993.

TARANTO (anciently Tarentum), a fortified seaport of S. Italy, in the province of Lecce, on a rocky peninsula at the northern extremity of the gulf of same name. The manufactures include linen, cotton, velvet, muslin, and gloves. Taranto is now a station of the Italian



navy, with a naval arsenal, etc. The ancient Tarentum was founded by the Greeks in B.C. 708, and became a powerful city. It was captured by the Romans B.C. 272, and remained a notable Roman town until the downfall of the empire. Pop. 26,670.

TARAN'TULA, a kind of spider, found in some of the warmer parts of the south-



Tarantula.

western states, Mexico, and in Italy. When full grown it is about the size of a chestnut, and is of a brown color. Its bite was at one time supposed to be

dangerous, and to cause a kind of dancing disease; it is now known not to be worse than the sting of a common wasp.

TARAPACA, a coast province of Northern Chile, containing deposits of niter and borax and silver mines; area, 19,300 sq. miles. Capital, Iquique. Pop. 89,751.

TARBELL, Ida Minerva, American author, born in 1857 in Erie co., Pa. In 1894 she became an associate editor of McClure's Magazine. Her publications include: Short Life of Napoleon Bonaparte, Life of Madame Roland, Early Life of Abraham Lincoln (in collaboration with J. McDavis), Life of Abraham Lincoln, and History of the Standard Oil Company.

TARE, the common name of different species of leguminous plants, known also by the name of vetch. There are numerous species and varieties of tares or vetches, but that which is found best adapted for agricultural purposes is the common tare, of which there are two principal varieties, the summer and winter tare. They afford excellent food for horses and cattle, and hence are extensively cultivated throughout Europe.

TARGET, (1) a shield or buckler of a small kind, such as those formerly in use among the Highlanders, which were circular in form, cut out of ox-hide, mounted on strong wood, strengthened by bosses, spikes, etc., and often covered externally with a considerable amount of ornamented work. (2) The mark set up to be aimed at in archery, musketry, or artillery practice and the like. The targets used in rifle practice are generally square or oblong metal plates, and are



Target.

divided into three or more sections, called bulls' eye, inner (or center), and outer, counting from the center of the target to its edges; some targets have an additional division (called a magpie), situated between the outer and the inner. It is the marksman's aim to put his shots as near the central point as possible, as if he hits the bull's eye there are counted in his favor 5 points, the center 4 points, the magpie 3 points, and the outer 2 points, or some similar proportions.

TARLATAN, a thin and fine fabric of cotton, mostly used for ladies' ball dresses. It is cheap, but does not stand washing.

TARN, a department of Southern France, named from the river of same name; area, 2218 sq. miles. The minerals include iron and coal, both of which are partially worked. Woolens, linens, hosiery, etc., are manufactured. The capital is Alby. Pop. 358,757.

TARN-ET-GARONNE, a department of France, named after its two chief rivers; area, 1436 sq. miles. This department belongs to the basin of the Garonne, which traverses it south to

TARSIUS

northwest, and receives within it the accumulated waters of the Tarn and Aveyron. The most important manufactures consist of common woolen cloth and serge, linen goods, silk hosiery, cutlery, leather, etc. Montauban is the capital. Pop. 214,046.

TARPAN, the wild horse of Tartary, belonging to one of those races which are by some authorities regarded as original. They are not larger than an ordinary mule. The color is invariably tan or mouse, with black mane and tail.



Tarpan.

During the cold season their hair is long and soft, but in summer it falls much away. They are sometimes captured by the Tartars, but are reduced with great difficulty to subjection.

TARPON, or TARPUM, a herring-shaped fish found on the southern coasts of the United States and in the West Indies. It reaches a length of 5 or 6 feet, and from a hundred to several hundred pounds weight, and is of giant strength. Though too coarse ordinarily for food, it is a great attraction to anglers. Its scales, which are of great size, are now largely used in ornamental work.

TARSIUS, a genus of quadrumanous mammals of the lemur family inhabiting the Eastern archipelago. In this genus



Tarsier.

the bones of the tarsus are very much elongated, which give the feet and hands a disproportionate length. Tarsius spectrum, the tarsier, seems to be the only species known. It is about the size

of a squirrel, fawn-brown in color, with large ears, large eyes, and a long tufted tail. It is nocturnal in its habits, lives among trees, and feeds upon lizards.

TARSUS, in anatomy, that part of the foot which in man is popularly known as the ankle, the front of which is called the instep. It corresponds with the wrist of the upper limb or arm, and is composed of seven bones. In insects the tarsus is the last segment of the leg. It is divided into several joints, the last being generally terminated by a claw, which is sometimes single and sometimes double. In birds the tarsus is that part of the leg (or properly the foot) which extends from the toes to the first joint above; the shank.

TARSUS, an ancient city of Asia Minor, the capital of Cilicia, now in the province of Adana, in Asiatic Turkey. The Apostle Paul was born, and Julian the Apostate was buried there. Pop. 8500.

TARTAN, a well-known species of cloth, checkered or cross-barred with threads of various colors. It was originally made of wool or silk, and constituted the distinguishing badge of the Scottish Highland clans, each clan having its own peculiar pattern. An endless variety of fancy tartans are now manufactured, some of wool, others of silk, others of wool and cotton, or of silk and cotton.

TARTAR, the substance called also argal or argol, deposited from wines incompletely fermented, and adhering to the sides of the casks in the form of a hard crust. When purified it forms cream of tartar. What is called tartar emetic is a double tartrate of potassium and antimony, an important compound used in medicine as an emetic, purgative, diaphoretic, sedative, fubrifuge, and counter-irritant. Tartar of the teeth is an earthy-like substance which occasionally concretes upon the teeth, and is deposited from the saliva. It consists of salivary mucus, animal matter, and phosphate of lime.

TARTARIC ACID, the acid of tartar. It exists in grape juice, in tamarinds, and several other fruits; but principally in bitartrate of potassium, or cream of tartar, from which it is usually obtained. It crystallizes in large rhombic prisms, transparent and colorless, and very soluble in water. It is inodorous and very sour to the taste. A high temperature decomposes it, giving rise to several new products. The solution of tartaric acid acts with facility upon those metals which decompose water, as iron and zinc. There are five modifications of tartaric acid, characterized chiefly by the differences in the action exerted by them upon a ray of polarized light; such as dextro- or ordinary tartaric acid, lævo-tartaric acid, para-tartaric or racemic acid, meso-tartaric acid, and meta-tartaric acid. Tartaric acid is largely employed as a discharge in calico-printing, and for making soda-water powders and baking powders. In medicine it is used in small doses as a refrigerant.

TARTARS. See Tatars.

TARTARY, a name formerly applied to the wide band of country extending through Central Asia from the seas of Japan and Okhotsk in the east to the Caspian on the west, and including

Manchooria, Mongolia, Turkestan, and all the south part of Russian Asia. It was used sometimes even to include a large portion of Southeastern Russia. In a restricted sense it is identical with Turkestan. It received its name from the Tartars or Tatars. See Tatars.

TASHKENT, or **TASHKEND**, a town of Asiatic Russia, in the government of Turkestan. The manufactures are silks, cottons, iron goods, etc. The trade, carried on chiefly by caravans, partly by railway, is very extensive. Tashkent was occupied by Russia in 1865, and a Russian quarter has grown up. Pop. about 156,414.

TASMANIA, formerly Van Diemen's Land, an island in the Southern ocean, fully 100 miles south of Australia, from which it is separated by Bass's strait; greatest length, 186 miles; mean breadth 165 miles; area, 24,330 sq. miles, or including islands, 26,215. Wheat, oats, barley, potatoes, pease, beans, and hops are largely cultivated, and the fruit includes grapes, cherries, plums, quinces, mulberries, peaches, apricots, walnuts, filberts, almonds, etc. Kangaroos and other animals of the pouched kind are numerous. There are two marsupial carnivorous animals called the Tasmanian wolf and the Tasmanian devil, both of



which are destructive to sheep. Another marsupial carnivore is the dasyure or native cat. The natural forests are chiefly of the eucalyptus or gumtree, pine, and acacia tribe. Among the minerals are gold, silver, copper, iron, tin, coal, freestone, limestone, and roofing slate. Mount Bischoff tin mine is a notably rich one. Tasmanian coal is now used on the railways. The staple export from Tasmania is copper, and the other articles include gold, silver, tin, wool, timber, fruit, hops, hides, and bark. Pop. 172,475.

TASMANNIA, a genus of plants, consisting of one Tasmanian and two Australian shrubs. The Tasmanian species possesses aromatic qualities, particularly in its bark. Its fruit is used by the colonists for pepper.

TASSO, Torquato, an Italian epic poet, was born at Sorrento 1544. At the age of sixteen he produced the Rinaldo, an epic poem in twelve cantos. The reputation of this poem procured for Torquato an invitation to the University

of Bologna, which he accepted. Here he displayed an aptitude for philosophy, and began to write his great poem of Gierusalemme Liberata (Jerusalem Delivered). In 1573 Tasso brought out the Aminta, a pastoral, which was represented at the court. In 1575 he completed his epic of Gierusalemme Liberata. In 1595, he proceeded to Rome at the request of the pope, who desired him to be crowned with laurel in the capitol, but the poet died while the preparations for the ceremony were being made. Tasso wrote numerous poems, but his fame rests chiefly on his Rime, or lyrical poems, his Aminta, and his Gierusalemme Liberata.

TASTE, the sense by which we perceive the relish or savor of a thing. The organs of this special sense are the papillæ, or processes on the surface of the tongue, and also certain parts within the cavity of the mouth and the throat, as the soft plate, the tonsils, and the upper part of the pharynx. See Tongue.

TATARS, or **TARTARS**, a vague term with no ethnological significance usually applied to certain roving tribes which inhabited the steppes of Central Asia. More specifically, however, Tatar or Ta-ta appears to have been the name of a tribe of Mongols who occupied about the 9th century a district of Chinese Tartary on the Upper Amur. The true Tatars formed part of the horde of Genghis Khan, when that conqueror carried his arms from the country known as Chinese Tartary to Europe, as well as to the successive hordes of similar origin who followed in their footsteps, and to the districts from which they came, or in which they settled; hence the names of Chinese Tartary, Independent Tartary, and European or Little Tartary, which comprised most of the Russian governments of Orenburg, Astrakhan, Ekaterinoslav, the Cossack provinces, and the Crimea.

TATTOOING, a practice common to several uncivilized nations, ancient and modern, and to some extent employed among civilized peoples. It consists in pricking the skin in a design, and introducing into the wounds colored liquids, gun-powder, or the like, so as to make it indelible. This practice is very prevalent among the South Sea islanders, among whom are used instruments edged with small teeth, somewhat resembling those of a fine comb. Degrees of rank are sometimes indicated by the greater or less surface of tattooed skin.

TAUNTON, a town, capital of Bristol co., Massachusetts, about 33 miles south of Boston. It is well built and contains a great number of handsome edifices. The manufactures consist of locomotives, cotton machinery, Britannia ware, nails, etc., and it has iron-works, cotton and paper mills, print-works, foundries, etc. Pop. 37,160.

TAURIDA, a government in the south of Russia; area, 24,539 sq. miles. It is watered by the Dnieper; the northern peninsula consists almost entirely of an extensive steppe, and the chief occupation of the inhabitants, who consist of Russians, is cattle-breeding and agriculture. Pop. 1,443,566. The capital is Simferopol.

TAURUS

TAURUS, the Bull, one of the twelve signs of the zodiac, which the sun enters about the 20th April. Taurus is also the second zodiacal constellation, containing 141 stars. Several of these are remarkable, as Aldebaran, of the first magnitude, in the eye; the Hyades, in the face; and the Pleiades in the neck.

TAUTOG, a fish found on the coast of New England, and valued for food. See Blackfish.

TAVOY, a district in the Tenasserim division of Lower Burmah; area, 7150 sq. miles. Pop. 84,988. The chief town is Tavoy, situated about 30 miles from the mouth of the river of the same name. Pop. 15,000. There is also an island of Tavoy about 18 miles long and 2 broad, and on the eastern side there is a well-sheltered harbor called Port Owen.

TAX, a contribution levied by authority from people to defray the expenses of government or other public services. A tax may be a charge made by the national or state rulers on the incomes or property of individuals, or on the products consumed by them. A tax is said to be direct when it is demanded from the very persons who it is intended or desired should pay it, as, for example, a poll-tax, a land or property-tax, an income-tax, taxes for keeping manservants, carriages, dogs, and the like. It is said to be indirect when it is demanded from one person in the expectation and intention that he shall indemnify himself at the expense of another; as, for example, the taxes called customs, which are imposed on certain classes of imported goods, and those called excise duties, which are imposed on home manufactures or inland production. Taxes are also rates or sums imposed on individuals or their property for municipal, county, or other local purposes, such as police taxes, taxes for the support of the poor (poor-rates), taxes for the repair of the roads and bridges, etc. In Great Britain and elsewhere house taxes or taxes on rental form the largest part of the local revenues, municipal revenues being, indeed, entirely raised from this source. Adam Smith has laid down four principles of taxation, which have been generally accepted by political economists. These are: (1) The subjects of every state ought to contribute to the support of the government as nearly as possible in proportion to their respective abilities. (2) The tax ought to be certain, not arbitrary. (3) Every tax ought to be levied at the time or in the manner most convenient for the contributor. (4) Every tax ought to be so contrived as both to take out and keep out of the pockets of the people as little as possible over and above what it brings into the public treasury of the state. See also Income-tax, Customs, Excise, etc.

TAXIDERMY, the art of preparing and preserving the skins of animals, and also of stuffing and mounting.

TAXODIUM, a genus of deciduous cypress, a common ornamental tree, is a native of North America. The bark exudes a resin which is used by the negroes for dressing wounds, and the roots, which are hollow inside, are used for bee-hives.

TAY, the longest river in Scotland,

and the one that carries to the sea a greater volume of water than any other in the British islands. Its length is about 120 miles, its greatest breadth in the estuary $3\frac{1}{2}$ miles, and the area drained 2400 sq. miles. It is navigable as far as Perth, but Dundee is the chief port. The salmon fisheries are important.



Taxodium.

TAYLOR, Bayard, American poet, born at Kennett Square, Pennsylvania, in 1825, died in 1878. He traveled extensively, giving his experiences in Views Afoot in Europe, The Lands of the Saracens, Visit to India, China, and Japan, Crete and Russia, Byways of Europe. He also published several novels; various volumes of verse, such



Bayard Taylor

as Rhymes of Travel, A Book of Romances, Lyrics, and Songs, Poems and Ballads, Poems of the Orient, The Masque of the Gods, and a translation of Goethe's Faust in the original meters. He was for some time United States secretary of legation at St. Petersburg, and latterly he was United States ambassador at Berlin, where he died.

TAYLOR, Jeremy, one of the greatest names in the Church of England, was born in 1613 at Cambridge; died at Lisburne, Ireland, in 1667. He was entered, in 1626, as a sizar in Caius college, where he graduated Master of Arts; and in 1636 obtained by the patronage of

TAYLOR

Archbishop Laud a fellowship of All Souls college, Oxford. In 1638 he was presented by Bishop Juxon to the rectory of Uppingham, in Rutlandshire, and in 1642 he was appointed chaplain in ordinary to Charles I. Afterward he removed to London, but in 1658 he accepted an invitation from Lord Conway to reside at his seat in Ireland. Here he remained until the Restoration,



Jeremy Taylor.

when he was elevated to the Irish see of Down and Connor, with the administration of that of Dromore. He was also in the same year, made a privy-councillor for Ireland, and chosen vice-chancellor of the University of Dublin. The greater part of his writings consist of sermons and devotional pieces, and upon the former rests his fame as a master of varied English prose.

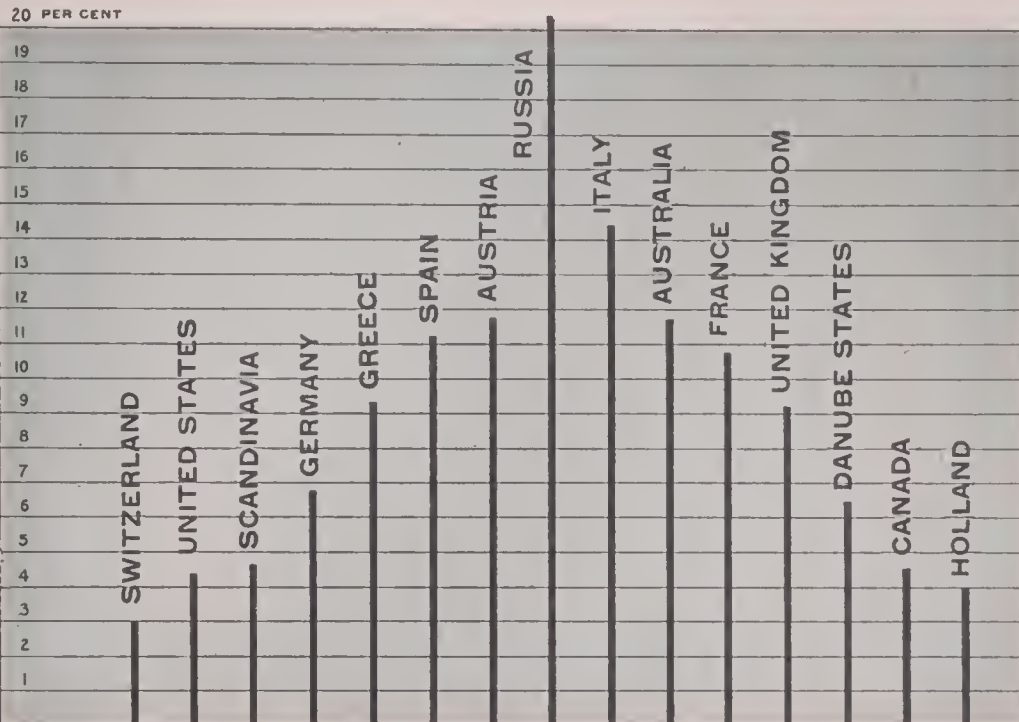
TAYLOR, John, The successor of Brigham Young as president of the Church of Jesus Christ of Latter-Day Saints, was born in England in 1808. In 1836 he joined the Mormon church and was elected one of the twelve apostles. In 1849 he was appointed to the European mission; he published a Mormon monthly in Paris and translated the Book of Mormon into French and German. In 1854, he was stationed in New York as superintendent over the Eastern churches and there published the Mormon. In 1858 he was indicted for treason against the United States government. On October 6, 1880, he was elected president of the church. He died in 1887.

TAYLOR, Richard, a confederate soldier, familiarly known as "Dick" Taylor, was born at New Orleans in 1826. He fought under Stonewall Jackson in the Shenandoah valley campaign, and in the Seven Days' battle before Richmond. On April 8, 1864, he defeated General Banks at Sabine Cross roads. On May 4, 1865, he surrendered to General Canby. He published Destruction and Reconstruction (1879). He died in 1879.

TAYLOR, Tom, born at Sunderland in 1817, died 1880. The most popular of his plays are: New Men and Old Acres, Masks and Faces (in collaboration with Charles Reade), Still Waters Run Deep, The Overland Route, and The Ticket of Leave Man. His historic dramas include: The Fool's Revenge, Joan of Arc, 'Twixt Axe and Crown, Lady Clancarty, Anne Boleyn, etc. He also published biographies of B. R.

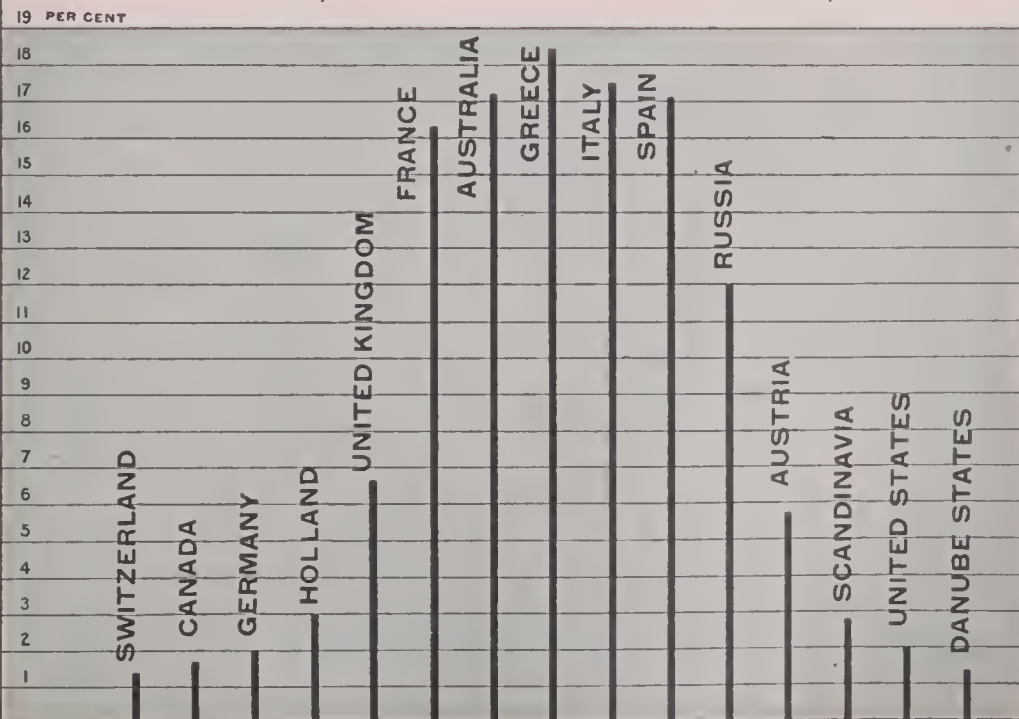
TAXES AND EARNINGS COMPARED

PERCENTAGE OF FORMER TO LATTER

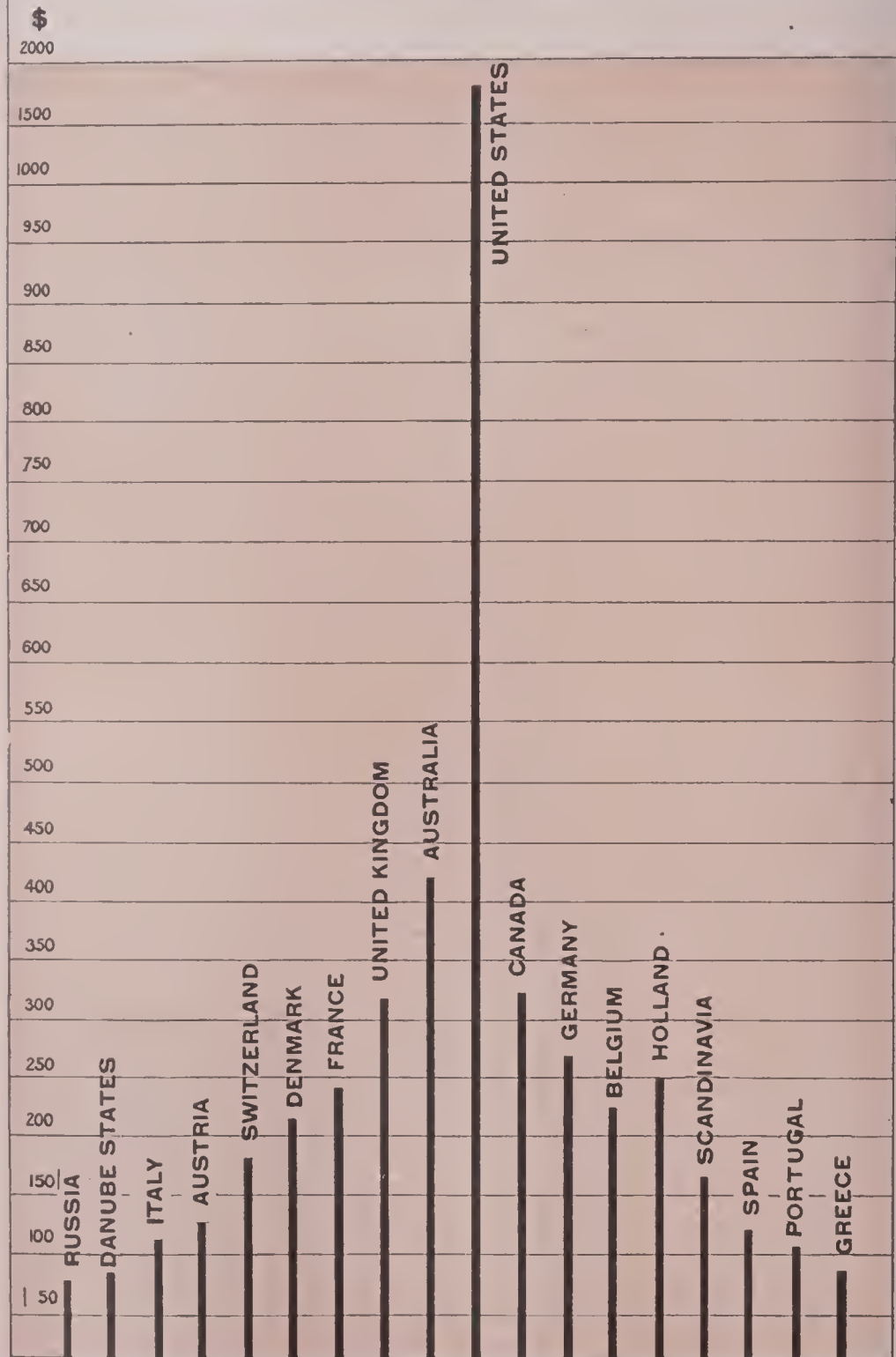


DEBT AND WEALTH COMPARED

PERCENTAGE OF DEBT, AFTER DEDUCTING STATE RAILWAYS, TO WEALTH



EARNINGS PER INHABITANT



Haydon (1853), C. R. Leslie (1859), and Sir Joshua Reynolds (1865).

TAYLOR, Zachary, twelfth president of the United States, born in Orange county, Virginia, 1784; died 1850. He entered the army in 1808, and rose to the rank of major; took command of the United States forces at the outbreak of the Mexican war. His victory over the Mexicans at Buena Vista, with only 5,500 men against an army of 21,000,



Z Taylor

commanded by President Santa Anna, created great enthusiasm, and "Old Rough-and-Ready," as he was called in the army, was nominated in 1848 for president of the United States, and though opposed by General Cass, Martin Van Buren and C. F. Adams, he was triumphantly elected, and entered upon the presidency in 1850. He only occupied the post four months, and died on July 9th, in that year.

TCHAD, CHAD, or TSAD, a large fresh-water lake of Central Africa, in the Soudan, having the territories of Bornou, Kanem, and Bagirmi surrounding it; length, about 150 miles; breadth, about 100 miles; area, about 20,000 sq. miles, with a variable expanse according as it is the wet or dry season.

TCHERNIGOV, TCHERNIGOFF, or TCHERNIGOW, a government of Little Russia, situated on the left bank of the Dnieper; area, 20,232 sq. miles. Agriculture and cattle-breeding are the chief employments; corn, linseed, timber, tobacco, and sugar are exported. Pop. 2,075,867.—Tchernigov, the capital, is situated on the Desna, about 80 miles n.e. of Kieff. Pop. 27,028.

TEA, a genus of plants comprising the species which yields most of the tea of commerce. By different modes of culture this species has diverged into two distinct varieties, entitled *Thea viridis* and *Thea bohea*. The former is a large hardy evergreen plant with spreading branches and thin leaves from 3 to 5 inches long; the latter is a smaller plant, and differs from the other in several particulars. From both, according to the

process of manufacture, black and green teas are procured. The tea plant is not only cultivated over a great part of China, but also in Japan, Tonquin, Cochin-China, Assam and other parts of India, and Ceylon. It has also been experimentally introduced into Carolina, Brazil, and Australia. Its growth is chiefly confined to hilly tracts; it is raised from seed, and the rearing of it requires great skill and attention. In seven years the plant attains the height of 6 feet, and the leaves are plucked off carefully one by one four times a year. In their green condition they are placed in a hot pan over a small furnace, and then rubbed lightly between the palms of the hands, or on a table. This process is repeated until the leaves become small, crisp, and curled. The black teas thus prepared include bohea, congou, souchong, and pekoe; the green teas, twankay, hyson-skin, young hyson, hyson, imperial, and gunpowder. Green tea gets less of the fire than black tea. The broken leaves, stalks, and refuse of the tea are compressed into solid bricks, and in this form it is imported by the Russians into the greater part of Central Asia, where (besides being used as a sort of coinage) it is sometimes stewed with milk, salt, and butter. There is considerable adulteration in the teas sent from China to the European market, and they are often artificially colored with a mixture of Prussian blue, or of gypsum and indigo carefully mixed. The infusion of tea-leaves in hot water yields a beverage which has little nutritive value, but it increases respiratory action, and seems to have a stimulative and restorative action on the nervous system. This is chiefly due to the essential oil and the theine (an alkaloid in its nature identical with the caffeine in coffee) which it contains, while the tannin, which is also present, acts as an astringent. If the water is boiling an infusion of ten minutes is sufficient to extract all the theine, and a longer period only adds to the tannin in the beverage, a result which is very hurtful to digestion. From historical sources we learn that tea was used in China as a beverage in the 6th century, and two centuries after its use had become common. In England we first find it mentioned about 1615 by an agent of the East India company; in 1660 Pepys says in his diary, "I did send for a cup of tea, a China drink, of which I never had drunk before." China until recent years, held almost a monopoly in the production of tea, but now India and Ceylon have entered the market as important competitors. Britain is the principal tea-consuming country in the world, coffee being less in favor there than in many other countries, the United States and Canada for example. The import of tea to the United States is less than half that of Britain.

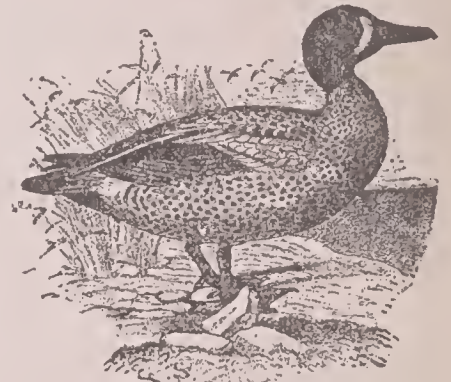
TEAK, a tree of the natural order Verbenaceæ, a native of different parts of India, as well as of Burmah and of the islands from Ceylon to the Moluccas. It grows to an immense size, and is remarkable for its large leaves, which are from 12 to 24 inches long, and from 6 to 18 broad. The wood, though porous, is strong and durable; it is easily sea-

soned and shrinks but little, and from containing a resinous oil it resists the action of water, and repels the attacks of insects of all kinds. It is extensively used in ship-building and for many other purposes.



Teak.

TEAL, the common name of the smallest and most beautiful of the duck family. Its length is about 14 inches. The green-winged teal is very like the



Blue-winged teal.

common teal. The blue-winged teal is somewhat larger than the common teal, and is easily domesticated. Both are North American.

TECHNICAL EDUCATION is the form of education received in specially equipped schools, where manual skill, and the practical application of science and art to manufactures, are taught. The recent demand for such instruction has arisen chiefly because, by the modern use of machinery and a highly-developed division of labor, the old apprentice system has broken down, and workmen in recent years have ceased to learn the complete practical details of their crafts.

TECHNOLOGY, that branch of knowledge which deals with the various industrial arts; the science or systematic knowledge of the industrial arts, as spinning, weaving, dyeing, metallurgy, brewing, and the like.

TE DEUM, a name (from the opening phrase *Te Deum Laudamus*) of the well-known Latin hymn usually ascribed to St. Ambrose and St. Augustine, although it cannot be traced farther back than the end of the 5th century. It is used in the ritual of the Roman Catholic and Anglican churches, being part of the morning service in the latter ("We praise thee, O God," etc.).

TEETH, the name given to certain hard structures growing out of the jaws of vertebrate animals, and serving as the instruments of mastication. The teeth of animals differ in shape, being destined for different offices. In man and the higher mammals two sets of teeth are developed, the early, milk or deciduous teeth, and the permanent set. In fishes the teeth fall off and are renewed repeatedly in the course of their lives. Teeth do not belong to the skeleton, but to the skin or exoskeletal parts of the body, and are homologous with hairs. In man the teeth are imbedded in sockets in the upper and lower jawbones. There are thirty-two in all, sixteen in each jaw, and each consists of the crown or visible part, and the fangs or buried part. The four central teeth of each jaw having chiseled-shaped crowns with sharp edges are called incisors; on each side of these four is the pointed canine tooth (which in the upper jaw are called the eye-teeth); on each side of these are two bicuspid teeth (premolars); and behind these again are the molar teeth, three on each side. (See Dental Formula.) The last of the permanent teeth to appear are the farthest back grinding teeth, which, owing to their arrival between the seventeenth and twenty-fifth years, are called the wisdom teeth. Each tooth has a central cavity filled with a soft pulp containing blood-vessels and nerves; this cavity is surrounded by dentine, a hard substance composed of phosphate and carbonate of lime; outside the fang is a cement-like substance resembling bone; while outside the crown is a hard enamel. In young teeth the enamel is covered by a delicate membrane called "the skin of the teeth," which in adult teeth is worn off. Toothache is due to decay of the substance of a tooth, dental caries as it is called. When the enamel which covers the tooth becomes flawed the underlying dentine is exposed and soon breaks down. When the decay, passing inward, reaches the pulp which contains the blood-vessels and nerves it causes inflammation, aching, and suppuration. Any treatment of toothache, short of extraction, is seldom satisfactory if the pulp has been actually attacked; but neuralgia is often mistaken for toothache. See Dentistry.

TEETOTALISM. See Temperance.

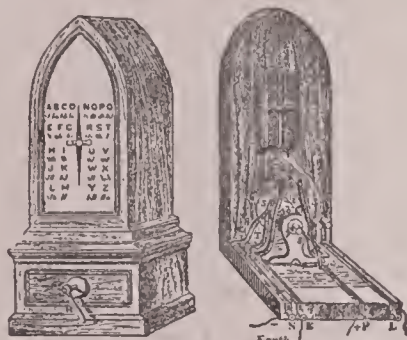
TEHERAN', capital of Persia, in Irak Ajemi, toward the northeast of the province, 66 miles south of the Caspian sea, at the southern base of Mount Elburz. Pop. (in winter), 210,000.

TEHUANTEPEC (tā-wān-te-pek'), a town of Mexico, in the state of Oaxaca, 14 miles above the mouth of a river of the same name, falling into the Pacific ocean. On account of a dangerous bar the river is little used for navigation. Pop., mostly Indians, 24,438. The town is near the south side of the Isthmus of Tehuantepec, the narrowest part of North America, having the Gulf of Tehuantepec on the Pacific side, the Bay of Campeachy on the Atlantic side; width, about 115 miles. There have been various schemes for constructing a canal or a ship railway across the isthmus, the most recent of the latter sort being that of an American engineer named

Eads. The idea was received with great favor in the United States, and in 1887 a bill passed the senate authorizing the incorporation of a company to carry out the project. The total length of the line, from the Atlantic to the port of Salina Cruz on the Pacific, was estimated at 135 miles, and the cost of construction at sixty million dollars. Capt. Eads, the projector, died in 1887. See Ship Railway.

TELAUTOGRAPH, a new writing telegraph, invented by Professor Elisha Gray, based on a novel system of transmission, whereby a facsimile reproduction of the handwriting of the sender of a message is effected.

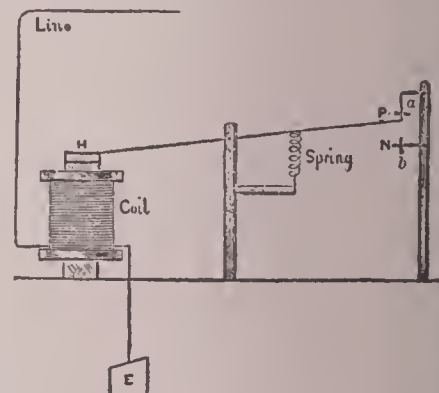
TELEGRAPH, a general name for any instrument or apparatus for conveying intelligence beyond the limits of distance at which the voice is audible, the idea of speed being also implied. Thus the name used to be given to a semaphore or other signalling apparatus. The word, however, is now usually restricted in its application to the electric telegraph, which from its power of rapidly conveying elaborate communications to the greatest distances has thrown all others into the shade. The electric telegraph, as comprising the entire system of apparatus for transmitting intelligence by elec-



Single-needle instrument.

tricity, consists essentially (1) of a battery or other source of electric power; (2) of a line-wire or conductor for conveying the electric current from one station to another; (3) of the apparatus for transmitting, interrupting, and if necessary reversing the current at pleasure; and (4) of the indicator or signalling instrument. The line-wires for overhead lines are usually of iron, protected from atmospheric influence by galvanizing or by being varnished with boiled linseed-oil, a coating of tar, or other means, and are supported upon posts, to which they are attached by insulators. (See Insulator.) In underground lines the wires are insulated by a gutta-percha or other non-conducting covering, and inclosed in iron or lead pipes. The battery and line-wire are common to all telegraphic systems; it is in the method of producing the signals that the great variation exists; but in all of them advantage has been taken of one or other of the three following properties of the current: (1) its power of producing the deflection of a magnetic needle, as in the galvanometer (which see); (2) its power of temporarily magnetizing soft iron; and (3) its power of producing chemical decomposition. The electro-magnetic instrument of Professor Morse, which,

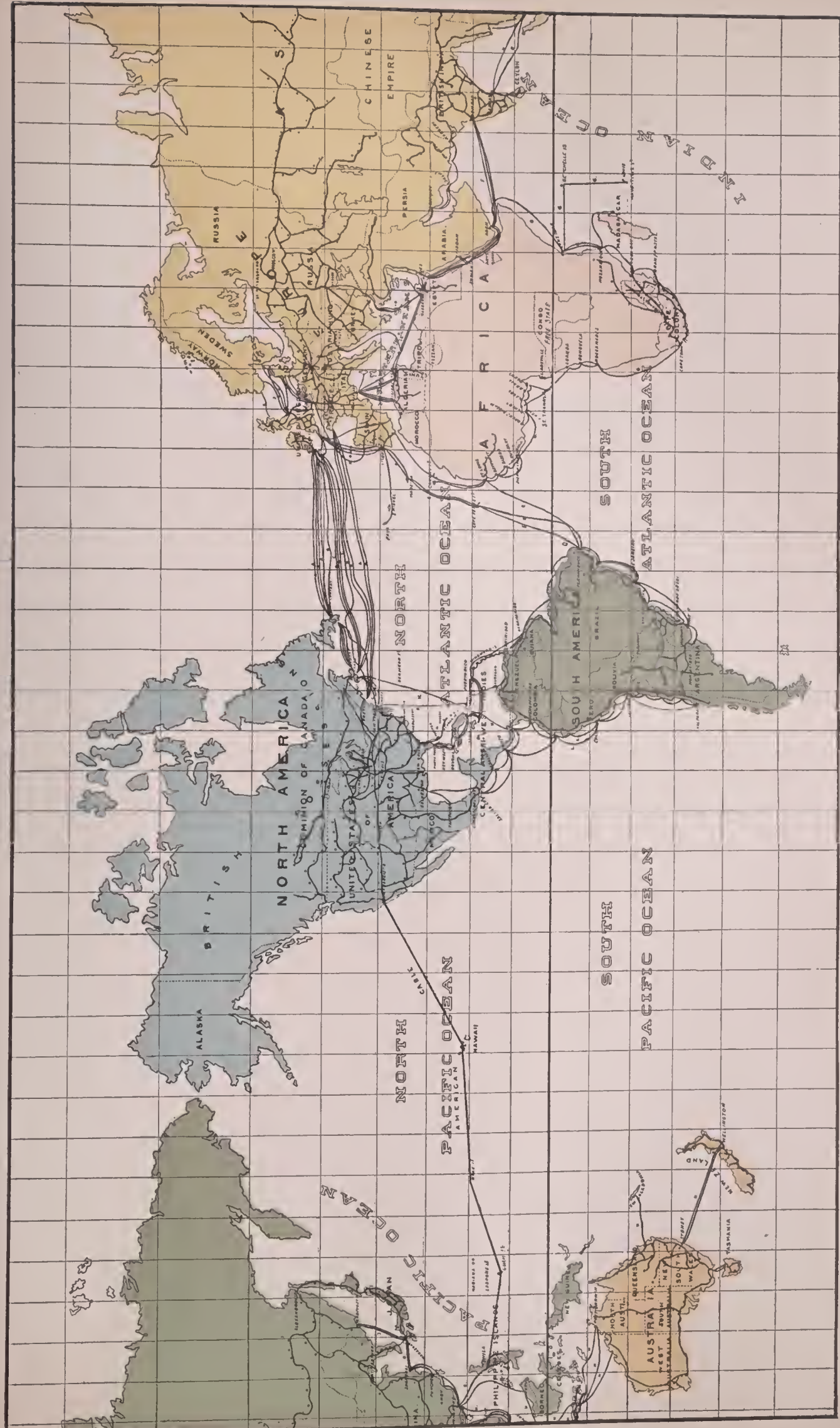
however, in its perfected form owed much to the genius of Morse's associates Joseph Henry and Alfred Vail, is an application of the second of the above properties. By means of an electro-magnet an armature which is attracted when the magnet is temporarily magnetized, a lever moved by the armature, and a style which moves with the lever, this instrument impresses a message in dots and dashes on a ribbon of moving paper, and by it forty words may be sent in a minute. This "dot and dash" system which was invented by Morse is now in extensive use. A modification of this instrument, called a sounder, in which the lever makes audible sounds by coming in contact with a brass rod, indicates the message by the length of the strokes produced. This is shown in the illustration, which shows the arrangement, by which the hammer-head is attracted, and the arm h p is brought into contact with the pin a. Upon the cessation of the current the spring brings down the arm upon the pin b. Frequently the Morse is simultaneously a recorder and sounder. It being necessary that this instrument should produce sharp and distinct impressions, and the current being weak for stages over 50 miles, a relay, or subsidiary electro-magnetic circuit, is added to it in the case of longer distances. The transmitting instrument is a lever, which, on being pressed, permits the current from the battery to flow into the line-wire during the time the contact is made. Both on account of its intrinsic merits and for the sake of uniformity the Morse is the most extensively used system, being that in use in America, and on the continent of Europe, and being also largely employed in Britain. Hughes' telegraph appears to be the best printing telegraph and is the instrument chiefly used by



Receiver or sounder.

the submarine telegraph companies. It works with one line of wire, and has about three times the speed of the Morse system, with the advantage that the message is printed in the ordinary Roman type. The machine is rather complicated, but its principle can be easily understood. A wheel having type engraved on its rim is made to revolve at a known rate; a strip of paper, as in the case of the Morse, is drawn off in a drum over a roller which lies under the rim of the revolving type-wheel; by means of the current the roller with the paper is raised against the type-wheel as the proper letter passes, and in this

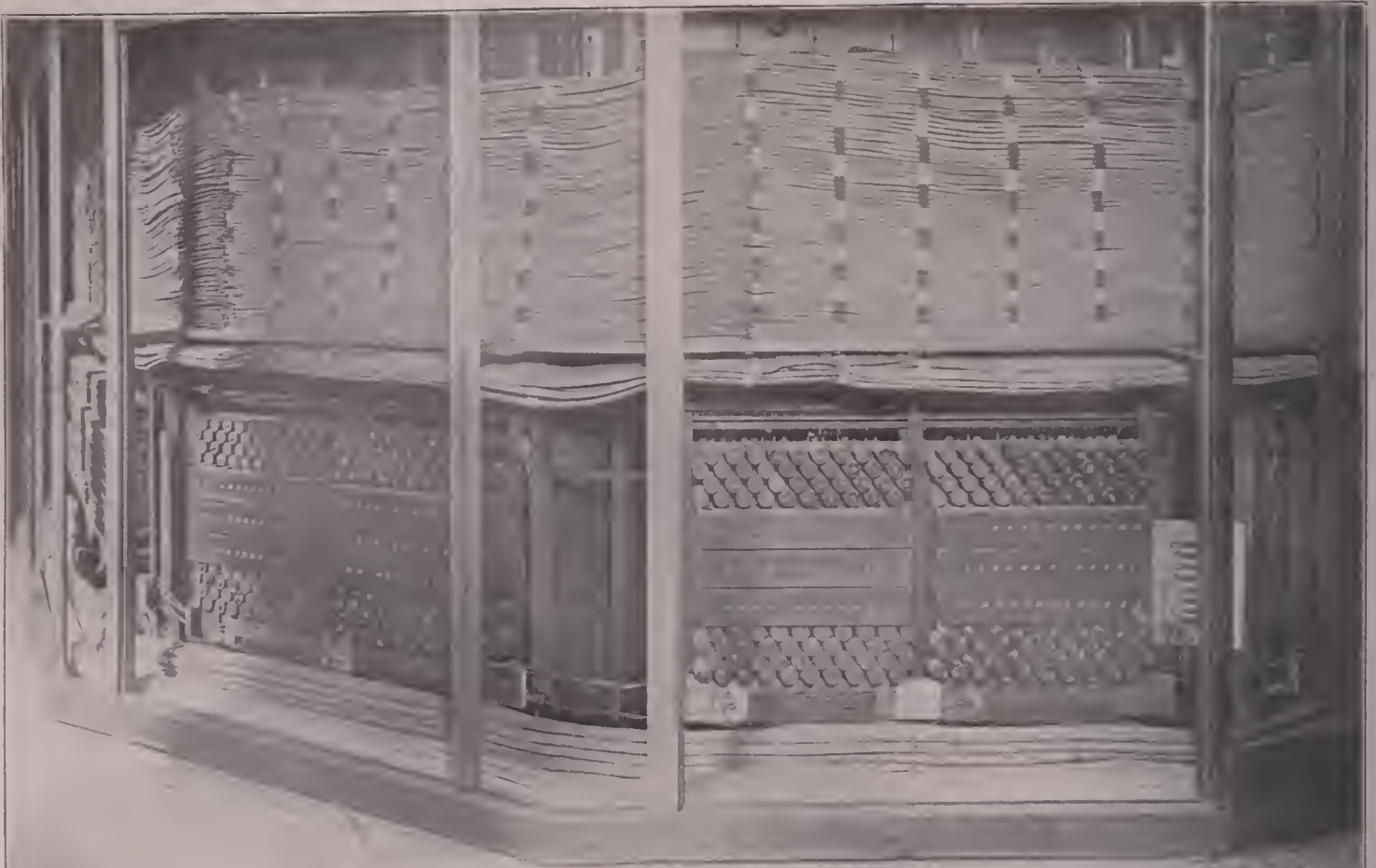
SUBMARINE AND LAND TELEGRAPH SYSTEMS OF THE WORLD



EXPLANATION

- A: ANGLO-AMERICAN TELEGRAPH COMPANY
- B: THE COMMERCIAL CABLE COMPANY
- C: WESTERN UNION TELEGRAPH COMPANY
- D: COMPAGNIE FRANÇAISE DU TELEGRAPHE
- E: BRAZILIAN SUBMARINE TELEGRAPH COMPANY
- F: EASTERN TELEGRAPH COMPANY
- G: EASTERN AND SOUTH AFRICAN TELEGRAPH COMPANY
- H: EASTERN EXTENSION, AUSTRALASIA AND CHINA TELEGRAPH COMPANY
- J: GREAT NORTHERN TELEGRAPH COMPANY
- K: WEST INDIA AND PANAMA TELEGRAPH COMPANY
- L: CENTRAL AND SOUTH AMERICAN TELEGRAPH COMPANY

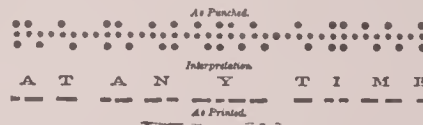
TELEPHONES.



THE CHICAGO TELEPHONE EXCHANGE OFFICE, FRONT AND REAR VIEW

way the despatch is printed. The operator works on a key-board much like that of a piano. Chemical telegraphs work on the principle that an iron wire pressing against a paper prepared with cyanide of potassium or other substance will, while a current is passing between the wire and the paper, produce a dark streak of Prussian blue or other mark, and when the current is interrupted the streak of pigment is interrupted. Bonelli's telegraph is worked by means of five wires. The message is set up in brass types in one line; the letters are common block letters; five styles, like the teeth of a comb, press against the raised portions of the type, and as the line of type is drawn through each style sends a current along its wire to a corresponding style pressing against prepared paper at the distant station, making a mark on the paper there corresponding to the raised portion of type which sends the current. The chief objection to Bonelli's telegraph is the five wires necessary between the stations. Autographic telegraphs are chemical telegraphs, and consist of a message written with a pen dipped in some non-conducting substance on a surface of tin-foil or other conducting material pasted on a cylinder which is made to revolve at a certain rate; a style presses against the surface, and is moved up or down the cylinder at a certain rate so as to describe a helical line; a current passes between the cylinder and style except when the non-conducting writing comes between them; at the distant station a similar cylinder covered with paper prepared with cyanide of potassium revolves at the same rate as the first cylinder; and its style being connected with the first style by means of the telegraph wire makes a mark of Prussian blue, which is a continuous helix, except when the current is interrupted at the first style. In this way a copy of the message in the handwriting of the sender is produced at a distant station. This is Bakewell's telegraph. Caselli's telegraph is similar in principle. Bain's automatic telegraph is Bonelli's telegraph, wherein by adopting the Morse alphabet one wire is sufficient; and the type is simply a strip of paper with dots and dashes punched in it. As early as 1747 Bishop Watson showed that signals might be sent through a wire stretched across the Thames by discharging a Leyden-jar through it. Volta's discovery of the galvanic pile, and Oersted's discovery of electro-magnetism, by supplying electricity of a kind more easily retained on the conducting wires, afforded much greater facilities for transmitting signals to a distance. Ampère, in 1820, proposed to utilize Oersted's discovery by employing twenty-four needles to be deflected by currents sent through the same number of wires; and Baron Schilling exhibited in Russia, in 1832, a telegraph model in which the signals appear to have been given by the deflections of a single needle. Weber and Gauss carried out this plan in 1833 by leading two wires from the observatory of Göttingen to the Physical Cabinet, a distance of about 9000 feet. The signal consisted in small deflections

of a bar-magnet suspended horizontally with a mirror attached, on the plan since adopted in Thomson's mirror galvanometer. At their request the subject was earnestly taken up by Professor Steinheil of Munich, whose inventions contributed more perhaps than those of any other single individual to render electric telegraphs commercially practicable. He was the first to ascertain that earth connections might be made to supersede the use of a return wire. He also invented a convenient telegraphic alphabet, in which, as in



Wheatstone's automatic system.

most of the codes since employed, the different letters of the alphabet are represented by different combinations of two elementary signals. His currents were magneto-electric, like those of Weber and Gauss. The attraction of an electro-magnet on a movable armature furnishes the means of signalling which is the foundation of Morse's telegraphic system, and which has been employed by Wheatstone to ring a bell calling attention before transmitting a message. About the year 1837 electric telegraphs were first established as commercial speculations in three different countries. Steinheil's system was carried out at Munich, Morse's in America, and Wheatstone and Cooke's in England. Among recent improvements in electric telegraphy are those by which a wire can be used for more than one message at a time. In 1872 a method of sending simultaneously two messages in opposite directions on the same wire was introduced, and it was also discovered that two messages could be sent in the same direction (duplex telegraphy). The two plans being combined formed quadruplex telegraphy. In wireless telegraphy electric waves transmitted through space are utilized by means of delicate instruments. See Wireless Telegraphy.

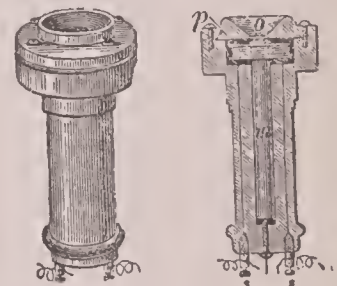
TELEGRAPH CABLE. See Submarine Cable.

TELEMACHUS (te-lem'a-kus), a son of Ulysses and Penelope, who is reputed to have gone through many adventures in search of his father after the close of the Trojan war. He is the hero of a French prose epic by Fénelon. (1699).

TELEOL'OGY, the science or doctrine of final causes; the doctrine which asserts that all things which exist were produced by an intelligent being for the end which they fulfil.

TEL'EPHONE, an instrument for transmitting the human voice or other sounds by means of electricity and telegraph wires. About the year 1860 the idea that sound-producing vibrations could be transmitted through a wire by means of electricity began to be recognized by several men of science. Reis of Frankfort invented an apparatus which could reproduce at a distant station the pitch of a musical sound by means of a discontinuous current along a telegraph wire. A great step in ad-

vance was made in 1876, when Prof. Graham Bell discovered an articulating telephone which depends upon the principle of the undulating current, and by means of which the very quality of a note, and therefore conversation itself, could be reproduced at a distant station. Several varieties of telephonic apparatus are now in use for inter-communication between distant places. The Bell telephone in its common form is shown in the accompanying cut. A strong ordinary bar-magnet *m* has round one of its ends a coil of fine silk-covered wire in metallic communication with the two terminals *s s*. One of the terminals communicates through a telegraph wire with one of the terminals of the coil of a precisely similar instrument at the other station, the remaining pair of terminals being connected through the earth, or through a return wire. Just in front of the extremity of the magnet there is a thin plate of iron *p*, and in front of this again there is the mouth-piece of a speaking-tube *o*. By this last the sounds to be transmitted are collected and concentrated, and falling on the metal plate cause it to vibrate. These vibrations in their turn excite undulating electric currents which correspond exactly with the vibrations; that is, with the original sounds. The



Bell telephone.

electric currents being transmitted to the receiving telephone cause corresponding vibrations in the plate or disc in it, and these reproduce to the ear the original sounds. The telephone is now an established institution throughout Europe and America. Telephone exchanges exist in all the principal towns, subscribers to which have their houses or places of business in direct communication with each other. Long distance lines are also rapidly joining city to city, the longest as yet in existence being the lines between New York and Chicago (1000 miles), and between Boston and Milwaukee (1300 miles), and New York and Denver (1954 miles). In 1907 extremely interesting tests were made by Count Arco, the Berlin electrical expert, who demonstrated the possibility of talking by wireless telegraphy. All the newest ships in the German, English, and American navies are now being fitted out with wireless telephone instruments. Experiments conducted by Capt. A. C. Knowles, U. S. A., have made it possible, by using a one wire circuit, the current passing through the horse to the ground, for officers to give commands while separated from their troops, and also to converse with one another without dismounting. See Wireless Telegraphy.

TELESCOPE, an optical instrument essentially consisting of a set of lenses fixed in a tube or a number of sliding tubes, by which distant objects are brought within the range of distinct, or more distinct vision. The law of action by which the telescope assists human vision is twofold, and that under all the varieties of its construction. A distant object viewed by the unaided eye is placed in the circumference of a large circle, having the eye for its center, and consequently the angle under which it is seen is measured by the minute portion of the circumference which it occupies. Now, when the distance is great, it is found that this angle is too small to convey to the retina any sensible impression—all the light proceeding from the object is too weak to affect the optic nerve. This limit to distinct vision results from the small aperture or pupil of the eye. The telescope substitutes its large object lens or reflector for the human eye, and consequently receives a quantity of light proportioned to its area or surface; hence a distant point, inappreciable by the eye alone, is rendered visible by the aid of the telescope. The rays of light, after transmission or reflection, converge to a point as they at first proceeded from a point, and thus an image of the object is formed which, when viewed by the eye-piece or lens, is more or less magnified. The telescope therefore assists the eye in these two ways: it gathers up additional light and it magnifies the object; that is to say, its image. The refracting telescope is constructed of lenses alone, which, by successive refractions, produce the desired effect. This instrument was formerly very cumbersome and inconvenient, inasmuch as its length had to be increased considerably with every accession of power; but the substitution of achromatic for ordinary lenses has rendered it more portable and convenient. The reflecting telescope is composed of specula or concave reflectors (see Speculum) aided by a refracting eye-piece. To this instrument we owe some of the most wondrous discoveries in astronomical science. The names of Newton, Gregory, Herschel, and Lord Rosse are connected with its history. The following diagrams exhibit the principles of construction and action in both sorts of telescopes. In Fig. 1, which



Fig. 1.

illustrates the refracting telescope in its simplest form, a and b are two lenses of different focal lengths. Rays of light from a distant object falling upon the object-glass a are converged to a focus at c. The eye-glass b, placed at its focal distance from the point of convergence, gathers up the diverging rays and carries them parallel to the eye magnifying the image formed at c. (See Optics.) The magnifying power of the instrument is as $ac : cb$, or as the focal length of one lens to that of the other. In this construction the object is seen inverted or turned upside down, and hence it is un-

suitable for terrestrial purposes. To render the image erect, and thus show it in its natural position, a more complicated eye-piece, consisting of two additional lenses, is necessary. Another refracting telescope, consisting of two lenses in its simplest form, is called the Galilean telescope. It differs from the former in having a concave lens for its eye-glass, which lens is placed nearer the object-glass than the focus of this lens, producing an image which is not inverted. This kind of telescope is the

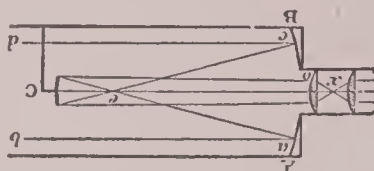
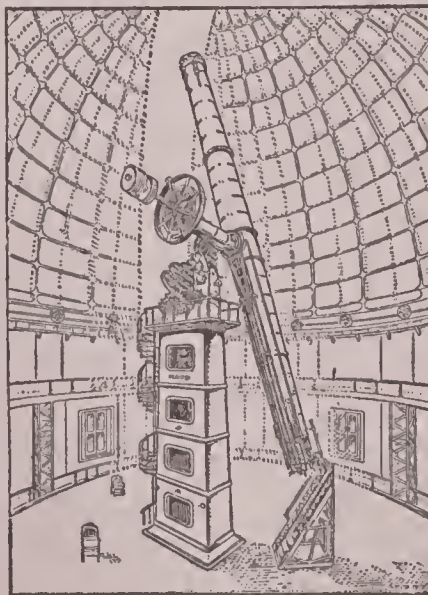


Fig. 2.

one used in opera-glasses and field-glasses. Fig. 2 shows the structure of the reflecting telescope as constructed by Dr. Gregory. a b is a large speculum perforated in the center; upon this fall the rays b, a and d, c, which are reflected to convergence at e. A smaller speculum, c, takes up the diverging rays and reflects them, slightly converging, through the aperture o, where they are received by a lens, and, after transmission, they intersect at x, and proceed to the eye-glass, whence they emerge parallel. The magnifying power of this instrument is great for its length, being as $\frac{o e}{e c} \times \frac{x C}{x o}$. In the telescope invented by Sir Wm. Herschel there is no second speculum, and no perforation in the center of the larger one placed at the bottom of the tube. The latter is fixed



The Lick telescope, Lick observatory, California.

in an inclined position so that the image formed by reflection falls near the lower side of the tube at its open end or mouth, where it is viewed directly by an eye-piece, without greatly interfering with the light. This arrangement in the case of large reflectors, is imposed by their great weight and difficult

management. Were it otherwise the ordinary construction would be preferred, the inclination of the speculum being a disadvantage. Chromatic aberration, which arises from the different refrangibilities of the different colored rays, and leads to the formation, by a lens, of a separate image of a bright object for each colored ray, is remedied by achromatizing the lens, that is, by constructing it of two or more lenses of different kinds of glass, so that the colors, separated by one, shall be reunited by the others. (See Achromatic.) The most powerful refracting telescope yet made is that in the Yerkes Observatory, Wisconsin, which has an object-glass 40 in. in diameter. The telescope in the Lick observatory, California, has an object glass three feet in diameter. A large number of refracting telescopes of 13 inches diameter have recently been constructed with which to conduct the photographic survey of the heavens, a camera being attached to the eye-piece end of each!

TELFORD, Thomas, engineer, born in 1757 in Eskdale, Dumfriesshire, which in 1782 he left for London. The greatest monument of his engineering skill, was the Menai Suspension-bridge, connecting Caernarvonshire with the Island of Anglesea, opened in 1826. The Conway bridge was also his, as well as the Dean bridge, Edinburgh, and the Broomielaw bridge, Glasgow. He died in 1834, and was interred in Westminster Abbey.

TELL, William, a famous peasant hero of Switzerland, reputed to have done some daring and wonderful feats in his resistance to the tyranny of the Austrian governor Gessler, but now proved to have been a mythical personage. In particular, having refused to do homage to Gessler's hat, set upon a pole, he was seized and condemned to death, but granted his life on condition of shooting with an arrow an apple placed on the head of his own son. This he did successfully, admitting at the same time that a second arrow he had intended for Gessler in case of failure. He was therefore still kept a prisoner; but while being conveyed over the Lake of Lucerne he managed to leap ashore, and soon after, having lain in wait for Gessler, he shot the tyrant dead. These stories professedly belong to the end of the 14th or early part of the 15th century, but contemporary historians know nothing of them; and similar stories belong to the legends and ballads of various peoples.

TELLER, Henry Moore, American politician, was born at Granger, N. Y., in 1830. In 1858 he removed to Illinois, and in 1861 to Colorado. He was a member of the United States senate from 1876 until he entered the cabinet of President Arthur as secretary of the interior in 1882. He left the republican national convention in 1896 after it had adopted a gold standard plank and supported W. J. Bryan for the presidency. In the same year he was returned to the senate as an independent silver republican, and in 1903 was re-elected as the regular democratic nominee.

TELLURIUM, a metal discovered in 1782, combined with gold and silver in

TEMBULAND

certain ores found in Hungary. The ores are denominated native, graphic, yellow, and black. The native tellurium is of a color between tin and silver, and sometimes inclines to a steel-gray. The graphic tellurium (or graphic gold) is steel-gray; but sometimes white, yellow, or lead-gray. These ores are found massive or crystalized.

TEM'BULAND, a district or dependency of the Cape Colony. The minerals include coal and copper. Pop. 180,415 (5179 Europeans).

TEMESVAR (tem'esh-vär), a town of Hungary, in the Temes Banat, in an extensive marshy plain on the Bega canal, 75 miles n.n.e. of Belgrade. The manufactures consist of woolens, silks, paper, tobacco, etc. Pop. 49,977.

TEMPERANCE SOCIETIES, the first association for the purpose of influencing public opinion in order to check the evil of intemperance appears to have been formed in Massachusetts in 1813. In 1826 a new impulse was given to the movement by the establishment in Boston on a more extensive plan of the American Society for the Promotion of Temperance. By 1831 more than 2200 societies, embracing 170,000 members, were in correspondence with the parent society. Reports of the movement in America soon began to have an effect on the other side of the Atlantic. In 1829 societies were formed in Scotland and Ireland. In 1830 the first temperance society in England was founded at Bradford, and by the close of the year there were in existence some thirty associations, numbering about 10,000 members. Since then many advocates of total abstinence have sought to enforce their views by legislative measures, as long ago exemplified in the celebrated Maine Liquor Law, for the suppression of the manufacture and sale of intoxicating beverages in the state of Maine. See Prohibition Party.

TEMPERATURE may be expressed as the state of a body with regard to heat, or the state of a body considered with reference to its power of communicating heat to other bodies. It often refers to the atmospheric heat of a locality at a particular time. When we speak of a body having a "high" or a "low temperature" it is implied that the condition of heat in the body may be compared with some standard. The means of such comparison is the thermometer. See Thermometer.

TEMPERATURE OF ANIMALS. See Animals.

TEMPERING, in metallurgy, the process of giving to metals, principally iron and steel, the requisite degree of hardness or softness, especially the process of giving to steel the necessary hardness for cutting, stamping, and other purposes. If heated and suddenly cooled below a certain degree it becomes as soft as iron; if heated beyond that degree, it becomes very hard and brittle. The process essentially consists in plunging the steel when red-hot into cold water or other liquid to give an excess of hardness, and then gradually reheating it until the hardness is reduced or brought down to the required degree. The excellence of all cutting steel instruments depends on the degree

of temper given to them. Different degrees of temper are indicated by different colors which the steel assumes. Thus steel heated to 450°, and suddenly cooled, assumes a pale straw color, and is employed for making razors and surgical instruments. See Steel.

TEMPLARS, an order of knights which had its origin in the Crusades. Subsequently its object became the defense of the Christian faith, and of the holy sepulchre against the Saracens. The knights took the vows of chastity, of obedience, and of poverty, like regular canons. The knights wore a white cloak adorned with an eight-pointed red cross (Maltese) on the left shoulder. The grand-master, the chief of the order, had the rank of a prince, and the order acknowledged the pope alone as its protector. The Templars established themselves in England about 1185, taking up their head-quarters in Fleet street, London, at the place still known as the



Templar.
Monument in Temple church, London.

Temple. Being compelled, in 1291, to leave the Holy Land, they transferred their chief seat to the island of Cyprus. By this time the wealth and power of the order had increased to such an extent, and their arrogance and luxury in proportion, that it was deemed necessary to suppress it. The Templars were put an end to on the charge that they had ambitious designs on European thrones, and that they held heretical views. Philip IV. of France and Pope Clement V. played into each other's hands in the work of suppression and spoliation. The pope, at the Council of Vienne, in Dauphiny, solemnly abolished the order by a bull of March 2, 1312. See Freemasonry.

TEMPLE, in architecture, an edifice designed for the performance of public worship. Magnificent temples were erected in ancient Greece and Rome, the Romans taking the Greek structures for models. The Egyptian temples were also remarkable structures. The most remarkable temple in the world, however, was that built by Solomon on Mount Moriah in Jerusalem. It was an oblong stone building, 60 cubits in length, 20 in width, and 30 in height. On three sides were corridors, rising above each other to the height of three stories. The fourth or front side was open, and was ornamented with a portico, 10 cubits in width, supported by

two brazen pillars. The interior was divided into the most holy place, which contained the ark of the covenant, and was separated by a curtain from the sanctuary, in which were the golden candlesticks, the table of the shew-bread and the altar of incense. The temple was surrounded by an inner court, which contained the altar of burnt-offering. Colonnades, with brazen gates, separated this court of the priests from the outer court, which was likewise surrounded by a wall. This temple was destroyed by the Assyrians, and after the return from the Babylonish captivity a second temple, but much inferior in splendor, was erected. Herod the Great rebuilt it of a larger size, surrounding it with four courts, rising above each other like terraces, the lowest of which was 500 cubits square, and was surrounded on three sides by a double, and on the fourth by a triple row of columns. In the middle of this inclosure stood the temple, of white marble richly gilt, 100 cubits long and wide, and 60 cubits high, with a porch 100 cubits wide. This magnificent edifice was destroyed by the Romans in A.D. 70.

TEMPLET, a pattern or mould used by masons, machinists, smiths, shipwrights, etc. It usually consists of a flat thin board, a piece of sheet-iron, or the like, whose edge is dressed and



Templet for a
Baluster.

shaped to the required conformation, and is laid against the object being moulded, built, or turned so as to test the conformity of the object thereto.

TEMPO (Italian for "time"), in music, a word used to express the rate of movement or degree of quickness with which a piece of music is to be executed. The degrees of time are indicated by certain words such as *lento* (slow), *adagio* or *largo* (leisurely), *andante* (walking pace), *allegro* (gay or quick), *presto* (rapid), *prestissimo* (very rapid), etc.

TENACITY, the measure of the resistance of bodies to tearing or crushing. Tenacity results from the attraction of cohesion which exists between the particles of bodies, and the stronger this attraction is in any body the greater is the tenacity of the body. Tenacity is consequently different in different materials, and in the same material it varies with the state of the body in regard to temperature and other circumstances. The resistance offered to tearing is called absolute tenacity, that offered to crushing, retroactive tenacity. The tenacity of wood is much greater in the direction of the length of its fibers than in the transverse direction. With regard to metals the processes of forging and wire-drawing increase their tenacity in the longitudinal direction; and mixed metals

have, in general, greater tenacity than those which are simple.

TENASSERIM, a maritime division of Burmah, about 500 miles in length, and from 40 to 80 in breadth, with an area of 46,730 sq. miles. Pop. 978,073.

TENCH, a fish belonging to the carp family. It inhabits most of the lakes of the European continent, and in Britain it is frequent in ornamental waters and ponds. It attains a length of from 10 to 12 inches. The color is generally a greenish-olive above, a light tint pre-



Tench.

dominating below. It is very sluggish, apparently inhabiting bottom-waters, and feeding on refuse vegetable matter. It is very tenacious of life, and may be conveyed alive in damp weeds for long distances. The flesh is somewhat coarse and insipid.

TENDON, the name given to the "sinews" by means of which muscles are inserted upon bones. They consist of bundles of white fibrous inelastic and very strong tissue disposed in bands, and separated by areolar or connective tissue.

TENERIFFE', TENERIFFA, the largest of the Canary islands, is of an irregularly triangular form, and has an area of about 780 sq. miles. It is of volcanic formation, composed principally of enormous masses and cones of trachyte, lava, and basalt, which culminate in the Peak of Teneriffe, 12,182 feet high. The principal productions are corn, wheat, potatoes, pulse, almonds, oranges, guavas, apples, honey, wax, silk, cochineal, and wine. Cochineal, tobacco, and wine are the chief exports. Pop. 105,062.

TENRIERS (ten-ers'), David, the name of two celebrated artists of the Flemish school, father and son, both natives of Antwerp, in which city the elder was born in 1582. He may be considered the founder of a style of painting which his son afterward brought to perfection. His pictures are mostly small. He died in 1649.—His son was born in 1610. He specially excelled in outdoor scenes, though many of his interiors are masterpieces of color and composition. His general subjects were fairs, markets, merry-makings, guard-rooms, taverns, etc., and his pictures, which number over 700, are found in all the important public and private galleries of Europe. His etchings are also highly esteemed. He died at Brussels in 1690.

TENNESSEE', one of the United States of North America (admitted into the Union in 1796), is bounded on the north by Kentucky and Virginia, east by North Carolina, south by Georgia, Alabama, and Mississippi, and west by Arkansas and Missouri; area, 42,050 sq. miles. Tennessee is popularly divided into three sections. East Tennessee, an

extensive valley, and agriculturally one of the most important sections of the state, stretches from the eastern boundary to the middle of the Cumberland table-land, which has an average elevation of 2000 feet above the sea, and abounds in coal, iron, and other minerals. Middle Tennessee extends from the dividing line on the table-land to the lower Tennessee river; and West Tennessee, from the Tennessee river to the Mississippi. The Unaka mountains, a part of the Appalachian chain, run along the eastern frontier, and have an average elevation of 5000 feet above the sea. The Mississippi, with the Tennessee and Cumberland, drains three-fourths of the state. The two latter are navigable for a considerable distance, and other rivers with numerous tributaries supply valuable water power. The climate is very healthy, the mean temperature of winter being 37.8°, and of summer 74.4°. The largest and most valuable crop is corn. Wheat and oats are the only other important cereals. Cotton is one of the leading crops. Hay and forage, peas and sorghum cane are noteworthy products, as are also Irish and sweet potatoes. Peanuts are grown in large quantities in the Tennessee valley. The climate is favorable to fruit culture, and there are over 14,000,000 fruit trees, more than half of which, 7,700,000 are apple trees. Watermelons and various vegetables are extensively raised. Tennessee stood first among Southern states in 1900 in the value of its lumber products. It is estimated that the state contains 27,300 sq. miles of wooded area. The rearing and fattening of live stock are carried on under pecu-



Seal of Tennessee.

liar advantages, and immense numbers of hogs grow up on the mast of the forests, which cover a very large area. The most valuable minerals found are coal, iron (both worked to a considerable extent), copper, marble, limestone, sandstone, granite, roofing slate, potters' clay, and kaolin. Also among the other minerals are gold (not found in paying quantities), lead, zinc, baryta, copperas, asbestos, etc. Petroleum, sulphur, chalybeate and salt springs are plentiful. The leading manufactures are iron and steel, cotton and woolen goods, furniture, cars, leather, oils, wines, spirits, etc. The state has the advantage of water transportation afforded by the Mississippi and Tennessee rivers. A

number of railroads cross the state, most of them centering in Memphis. The mileage increased from 1253 in 1860 to 1843 in 1880, 2767 in 1890, and 3712 miles in 1907. At the head of the educational establishments stand the University of Tennessee, Nashville university, the Cumberland, Vanderbilt, and Fisk universities, the last for colored students. De Soto reached the Mississippi at the present site of Memphis about 1541. La Salle, about 1682, built a fort at this point, and called it Port Prud'homme. The grant by Charles II. to the Lords Proprietors of Carolina of the territory between latitudes 29° and 36° 30' in 1665 included this territory. The most important effort of transmontane colonization by the British prior to 1760 was the establishment of Fort Loudon on the Little Tennessee river in 1756 or 1757. But in 1760 this post was captured by the Cherokees and its garrison massacred; and the same fate befell a number of colonists who had settled between Fort Chissel (on New River, Virginia) and Fort Loudon. Early in 1761 Colonel Grant completely routed the Cherokees and compelled their French and Spanish allies to withdraw to Louisiana and Georgia.

Eight years later the stream of emigration began to set westward, mainly by two routes, of which one led through Cumberland Gap to the valley of the Cumberland river, while the other followed the course of the Tennessee round the southern border of the Cumberland plateau into the western Tennessee valley. A body of emigrants from Virginia settled on the banks of the river Holston, in what is now Hawkins county and formed the nucleus of a rapidly increasing colony, which was mainly recruited from Virginia and North Carolina. The act of government for the "Territory South of the Ohio" was passed in April, 1790, and the seat of government was moved from Rogersville to Knoxville. In the same year the first territorial assembly met. In 1795 a constitutional convention was called, which met in January, 1796. A constitution for the "State of Tennessee" was adopted without submission to popular vote; the first general assembly met March 28th, and the state was admitted June 1, 1796. The progress of the state was rapid, almost entirely along agricultural lines. Turnpike roads were built in 1804, and after 1823 roads and canals were pushed forward. The first railroad was chartered in 1831, but the Memphis and Charleston road was not built until 1857. There was a strong Union party in the state at the outbreak of the civil war, and in February, 1861, the people refused to hold a convention to consider secession, but with President Lincoln's call for troops sentiment changed, and through the influence of Governor Harris the state declared itself by popular vote out of the Union, June 8th. The position of Tennessee during the civil war was the same as that of the other middle and southern states. While secession was in agitation, it refused to secede, but when actual hostilities commenced it joined the southern confederacy. Even then, however, west and middle Tennessee sympathized with the south,

while eastern Tennessee sided with the north. Each division sent very large contingents to the army which it favored. A large portion of the state was, during the later years of the war, in the occupation of the northern army, and many great battles were fought on its soil, notably those of Fort Donelson, Murfreesborough (Stone river), Franklin, and Nashville. Tennessee suffered more from the exhaustion attendant on the close of the war, and from the rigorous government which accompanied the period of reconstruction, than any other state except Virginia.

In the Presidential elections, with the exception of 1868 when it voted for Grant the state has been Democratic by large majorities. From the state have come many men of national reputation, including three presidents, Jackson, Polk and Johnson. The chief towns are Nashville (the capital), Memphis, Chattanooga, and Knoxville. Pop. 2,220,000.

TENNESSEE, a river of the United States, formed by the union of two streams in the eastern part of the state of Tennessee, flows southwest, passes through the northern part of Alabama, then flows north through the western part of Tennessee and Kentucky, and enters the Ohio, of which it is the largest tributary, about 10 miles below the confluence of the Cumberland. Length, about 1200 miles. It is navigable 259 miles for steamers to Florence, at the foot of the Mussel-shoal rapids, which are passed by a canal 36 miles long; and above these there is navigation for boats for 250 miles.

TENNESSEE, The. A formidable confederate ram crippled by the Hartford of Admiral Faragut's fleet, and taken in Mobile harbor on August 5, 1864.

TENNESSEE, UNIVERSITY OF. A coeducational state institution at Knoxville, Tenn., founded in 1794. The institution comprises the college of Agriculture and Mechanic Arts and the university proper. The college has an agricultural department, an engineering department, a literary department, and an industrial department for colored students (Knoxville college). The university consists of an academic department with courses for the graduate degrees of M.A. and M.S. and professional courses in engineering, law, medicine, and dentistry, the medical and dental departments being situated in Nashville. The university has a liberal system of accredited scholars whose certificates are accepted in place of the entrance examinations.

TENNESSEE CENTENNIAL EXPOSITION, an exposition held in Nashville, Tenn., May 1 to October 30, 1897, to celebrate the one hundredth anniversary of the admission of the state into the Union. The site covered about 20 acres.

TENNIS, a game in which a ball is driven continually against a wall in a specially constructed court, and caused to rebound beyond a line at a certain distance by several persons striking it alternately with a racket, the object being to keep the ball in motion as long as possible without allowing it to fall to the ground. The game was introduced into England in the 13th century, and

continued to be very popular with the nobility to the reign of Charles II. The modern game of rackets is a descendant of tennis. Lawn Tennis is a recent modification of the game. See Lawn Tennis.

TENNYSON, Alfred, Lord, was born on 6th August, 1809. As early as 1827 he had published, in conjunction with his brother Charles, Poems by Two Brothers, but his literary career may be said to date from 1830, when he published a volume entitled Poems, chiefly Lyrical. Its success was sufficient to encourage the poet to prepare a second collection, which appeared in 1833, and contained such poems as A Dream of Fair Women, The Palace of Art, Cenone, The Lady of Shalott, and others.



Lord Alfred Tennyson.

It was not till 1842 that he again appealed to the public with a selection of his poems in two volumes, and it is from this time that we find his work beginning to receive wide recognition. The collection then issued included Morte d'Arthur, Locksley Hall, The May Queen, and The Two Voices, all of which, it was almost at once acknowledged, entitled him to rank very high. His reputation was more than sustained by the works that immediately followed. These were: The Princess, a Medley; In Memoriam, written in memory of his friend Arthur, Hallam; and the Ode on the Death of the Duke of Wellington. The latter was his first great poem after receiving the laureateship upon the death of Wordsworth. From that time hardly a year passed without his adding some gem to our language. In 1855 Oxford university conferred on him the degree of D.C.L., and in 1869 the fellows of Trinity college, Cambridge, elected him an honorary fellow. From 1875 onward he gave various dramas to the public: Queen Mary, Harold, The Cup, The Falcon, The Promise of May, Beckett, and the Foresters. Several of these were put upon the stage. Tennyson was raised to the peerage as Baron Tennyson in 1884. He died 6th Oct., 1892. Few writers have developed so rare a mastery of English as a poetic instrument, and his works are assured of a high rank in the ultimate judgment of the literature of the 19th century.

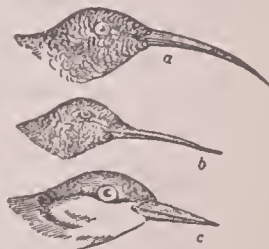
TENOR, in music, is the more delicate of the two adult male voices, and its compass generally extends from C in the bass to G or A in the treble. The qualities of the tenor render it suitable

to the expression of tender and delicate sentiments. In a vocal composition of four parts the tenor forms the second middle part, deeper than the alto, but higher than the bass; but in the song of four male voices the tenor, as the first voice, leads the chief melody, and as the second is the higher middle voice. The clef of this voice is the C clef, placed upon the fourth line of the staff.

TENT, a portable dwelling-house, formed usually in the simplest manner, of canvas, for instance, stretched with cords upon poles. The tent of private soldiers in the British service are of a conical form with circular basis, supported by a vertical pole in the center 10 feet high. The outside diameter of the tent, which accommodates fifteen infantry or twelve cavalry soldiers, is 17 feet 3 inches. The officers' marquees as well as the hospital and laboratory tents, are oblong, and are supported by two standards connected by a ridge pole 6 or 7 feet long. The soldiers' tent in the United States army are of the ridged variety.

TENTACLE, in zoology, an elongated appendage proceeding from the head or cephalic extremity of many of the lower animals, and used as an instrument of exploration and prehension. Thus the arms of the sea-anemone, the prehensile processes of the cirripeds and annelids, the cephalic feet of the cephalopods, the barbs of fishes, are termed tentacles.

TENUIROSTRES, one of the four sections into which the order Insectores of birds is divided. This group, represented by the humming-birds, creepers,



Heads of tenuirostres. a, Sun-bird. b, Humming-bird. c, European nuthatch.

sun-birds, hoopoes, etc., is characterized by the generally elongated bill, which usually tapers to a point.

TERCEIRA (ter-sā'i-rà), an island of the Atlantic, one of the Azores; greatest length, 20 miles; average breadth, 13 miles; area, 223 sq. miles. The soil possesses great natural fertility, and heavy crops of grain, pulse, etc., and abundance of oranges, lemons, and other fruits are produced. The capital is Angra. Pop. 46,528.

TER'EBINTH, the common name for various resinous exudations, both of a fluid and solid nature, such as turpentine, frankincense and Burgundy pitch, Canada balsam, etc. The volatile oil of various of these resins is called oil of terebinth, or oil of turpentine. Terebinth is also a name for the turpentine-tree.

TERE'SA, St. See Theresa.

TERMITES (ter'mits), a family of insects, also known by the name of white ants. They have little affinity with the true ants, although they resemble them

in their mode of life. They are chiefly confined to the tropics, and are found very plentifully in Western Africa. They unite in societies, building their dwellings in the form of pyramids or cones, 10 or 12 feet high. These dwellings, which are so firmly cemented as to be capable of bearing the weight of three or four men, are divided off into several apartments as magazines, chambers, galleries, etc. Every colony of termites consists of a king and queen both of which are much larger than the other members of the colony, and of workers and soldiers without wings. The king and queen are the parents of the colony, and are constantly kept together, attended by a detachment of workers, in a large chamber in the heart of the hive, surrounded by stronger walls than the other cells. The queen is always gravid, the abdomen being enormously distended with eggs, which, as they are dropped, relays of workers receive and convey in their mouths to the minor cells throughout the hive. At the beginning of the rainy season a

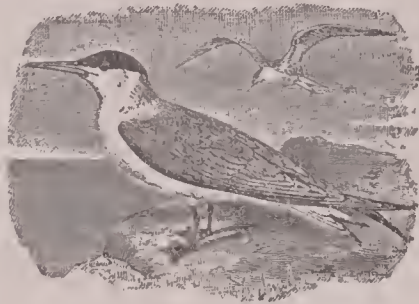


Dwellings of termites.

number of winged insects, both male and female, are produced. These, when mature, leave the hive and fly abroad, afterward shedding their wings, and becoming the kings and queens of future colonies. The soldiers and workers, both neuter, or of no fully developed sex, and differing merely in the armature of the head, are distinct animals from the moment they leave the egg, the young differing from the adult of the same class only in size. The duties of the workers are to build the habitations, make covered roads, nurse the young, attend on the king and queen, and secure the exit of the mature winged insects, while to the soldiers, whose mandibles are powerfully developed for that purpose, is committed the defense of the community which duty they perform systematically and with desperate courage. There are many species of termites, all of which are fearfully destructive to wood.

TERN, or **SEA-SWALLOW**, a genus of birds, included in the gull family. The terns are distinguished by the long, slender, and straight bill, long and pointed wings, and forked tail. The legs are relatively shorter than in the gulls. It is a very active bird, seeming to have a ceaseless flight, and feeding upon small fishes. Its average length is 15 inches. The color is black on the head and neck, and ashy gray on the upper parts generally. The under parts are white, the legs, feet, and bill being red.

TERNSTRÆMIA'CEÆ, a natural order of plants, consisting of trees or shrubs; with alternate simple usually coriaceous leaves without stipules. The flowers are generally white, arranged in axillary or terminal peduncles, articulated at the base. This order is one of great economical importance, as it includes the genus *Thea*, from which the teas of commerce are obtained. The favorite garden camellia also belongs to it. The plants belonging to the order are principally inhabitants of Asia and America



Sandwich tern.

TERRA COTTA (Italian, "baked earth"), baked clay or burned earth, a similar material to that from which pottery is made, much used both in ancient and modern times for architectural decorations, statues, figures, vases, and the like. As now made it usually consists of potters' clay and fine powdered silica. It is produced of many different colors, the most pleasing being a rich red and a warm cream color. Large numbers of ancient statues, and especially statuettes, of terra cotta have been found in recent times, the most charming being the production of the city of Tanagra in Northern Greece (Bœotia).

TERRA DEL FUEGO. See *Tierra del Fuego*.

TERRA DI SIENNA, a brown ferruginous ochre employed in painting, and obtained from Italy. It is calcined before being used as a pigment, and is thus known as burned sienna.

TER'RAPIN, the popular name of several species of fresh water or tide water tortoises distinguished by a horny beak, a shield covered with epidermic plates, and feet partly webbed. They are active in their habits, swimming well and moving with greater agility on land than the land-tortoises. They are natives of tropical and warmer temperate countries, many being natives of North America. They feed on vegetables, fish, reptiles, and other aquatic animals. Their flesh is much esteemed. One species, called the salt-water terrapin, is abundant in the salt-water marshes around Charlestown. The chicken tortoise, so named from its flavor, is also an esteemed American species.

TERRE-HAUTE (târ-ôt; usually pronounced tere-hôt'), a town and important railway center in Vigo co., Indiana, on the Wabash, and Wabash and Erie canal. It is well built, and has numerous churches and schools (the state normal school, Rose Polytechnic institute, etc.), fine courts of justice, and an opera-house; extensive manu-

factures, and a considerable trade. There are rich beds of coal and iron in the vicinity. Pop. 43,175.

TERRY, Alfred Howe, American soldier, was born at Hartford, Conn., in 1827. In 1862 he was made a brigadier-general of volunteers. He was in a number of engagements but he is chiefly remembered in connection with the capture of Fort Fisher, which he accomplished in conjunction with Admiral Porter. For his services he was commissioned major-general of volunteers, and brigadier-general and brevet major-general in the regular army. In 1876 he commanded the main column which drove Sitting Bull and his followers into Canada after the massacre on the Little Big Horn. He died in 1890.

TERRY, Ellen Alicia, English actress, war born at Coventry, in 1848. She first appeared as the boy Manilius in the *Winters Tale* in 1856. In 1863 she appeared at the Haymarket theater in London, England. In 1878 she began her long association with Henry Irving, playing Ophelia to his Hamlet. Her principal roles are, Portia in the *Merchant of Venice*, Ruth Meadows in *Eugene Aram*, Juliet, Viola, in *Twelfth Night*, Marguerite in *Faust*, Madame Sans Gene, and Clerise in *Robespierre*. Her first visit to America with Irving was made in 1883, when she made a great success, repeated many times since.

TERRITORY, a term applied in the United States to an area similar to a state of the Union, but not having the independent position of a state, being directly under congress and having a governor and other chief officials appointed by the president, with a legislature of certain limited powers. Territories are usually admitted as states on attaining a sufficient population. In 1907 the territories were Arizona, New Mexico, District of Columbia and Alaska on the continent and Hawaii in the Pacific. The new possessions are Porto Rico in the West Indies and the Samoan islands, Guam and the Philippine islands in the Pacific. A government for Porto Rico was established by the Fifty-sixth Congress. The Philippines are under a provisional civil government, Guam and Tutuila under governors, and the Isthmian canal zone under a commission, all appointed by the president.

TERROR, Reign of, the term usually applied to the period of the French revolutionary government from the appointment of the revolutionary tribunal and the committee of public safety (6th April, 1793) to the fall of Robespierre (27th July, 1794). See *France (History)*.

TERTIAN FEVER. See *Ague*.

TERTIARY FORMATION. See *Geology*.

TERTULLIAN, in full Quintus Septimius Florens Tertullianus, the earliest Latin father of the church whose works are extant. His most celebrated work is the *Apologia*, a formal defense of Christianity addressed to the Roman magistrates. The works of Tertullian display great learning, much imagination, and a keen wit, but their style is bad. They are chiefly valuable for the light they throw on the doctrine and discipline of the church in the age in which he lived.

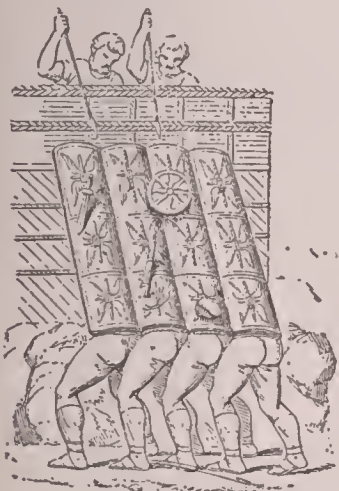
TERUEL', a town of Spain, in the province of the same name, on a hill near the Guadalaviar, 72 miles n.w. of Valencia, with which it carries on an active trade. It is inclosed by walls, has a Gothic cathedral, a bishop's palace, and a seminary. Pop. 8869.—The province has an area of 5491 sq. miles, and a pop. of 241,865.

TESLA, Nikola, electrician and inventor, was born in 1858, in Herzegovina. He studied engineering in Paris, and was engineer of the Edison station located there. For a time he was employed at Edison's laboratory, near Orange, N. J., but left to open a laboratory of his own. He has shown that electric lamps and motors can be operated on one wire without a circuit, and invented the rotary field motor, the multiphase system of which is used in the 50,000-horse-power plant built to transmit the water power of Niagara Falls to Buffalo and other places. He is considered one of the greatest living geniuses in the field of electric research.

TESTAMENT. See Will.

TESTAMENT, Old and New. See Bible.

TESTING, the process of examining various substances by means of chemical reagents, with the view of discovering their composition. The term testing is usually confined to such examinations as seek to determine what chemical elements or groups of elements are con-



Roman testudo, from Trajan's pillar.

tained in any substance, without enquiring as to the quantity of these elements. Testing is carried out either by the application of chemical reactions to solid substances, or by the application of reagents in solution to a solution of the substance under examination.

TESTUDO, among the ancient Romans a cover or screen which a body of troops formed with their oblong shield or targets, by holding them over their heads when standing close to each other. This cover somewhat resembled the back of a tortoise, and served to shelter the men from missiles thrown from above. The name was also given to a structure movable on wheels or rollers for protecting sappers.

TET'ANUS, a spasmodic rigidity of the whole body, such as frequently results from wounds, especially in warm climates. If the lower jaw is drawn to

the upper with such force that they cannot be separated the disorder is called lock-jaw. Tetanus frequently terminates fatally.

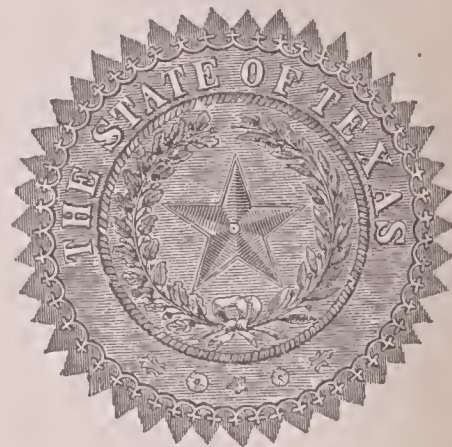
TE'TRARCH, a title which originally signified the governor of the fourth part of a country. By the Romans the title was used to designate a tributary ruler inferior in dignity to a king.

TEUTONIC PEOPLES, a term now applied (1) to the High Germans, including the German inhabitants of Upper and Middle Germany and those of Switzerland and Austria. (2) The Low Germans, including the Frisians, the Plattdeutsch, the Dutch, the Flemings, and the English descended from the Saxons, Angles etc., who settled in Britain. (3) The Scandinavians, including the Norwegians, Swedes, Danes, and Icelanders. See Philology, Indo-European Languages.

TEWFIK PASHA, Mahommed, Khedive of Egypt, eldest son of Khedive Ismail, was born in 1852, and succeeded to the vice-royalty by decree of the sultan, August 8, 1879, upon the forced abdication of his father. He was the sixth ruler of Egypt in the dynasty of Mohammed Ali Pasha. He died in 1892.

TEXAS, one of the United States, bounded by Mexico, New Mexico, Oklahoma, Arkansas, Louisiana, and the Gulf of Mexico; length, east to west, 825 miles; breadth, 740 miles; coast-line, 400 miles; it is the largest state in the Union, having an area of 265,780 miles. Its area is larger than the combined area of the Atlantic states from Maine to Virginia, inclusive, and nearly one-third greater than that of the whole German empire. The surface in the northwest is covered with mountains, which, in proceeding southwest, subside into hills and undulating plateaus, succeeded, on approaching the Gulf of Mexico, by low alluvial plains. These extend inland from 20 to 80 miles, are furrowed with deep ravines, and consist for the most part of rich prairie or forest land. The hilly region behind this is formed chiefly of sandstone and limestone ridges, separated by valleys of considerable fertility. In the mountainous region many of the summits are lofty, and covered with snow most of the year. The general slope of the country gives all the rivers a more or less southerly direction. The Rio-Grande, rising in New Mexico, forms the west and southwest boundary of the state. The Red river, which has its source in Mexico forms the greater part of the northern boundary. The other important rivers are the Colorado, the Brazos, the San Jacinto and Trinity, and the Sabine, which, during the greater part of its course, is the boundary between Texas and Louisiana. A long chain of lagoons stretches along the Gulf of Mexico. Texas has a warm climate, but the great range in latitude produces a considerable range in climatic conditions. Although warm, the climate is drier and less enervating than that of the other Gulf states. The alluvial bottom lands around the lower river courses are the most fertile portions of the state. The soil of the coastal plain is generally sandy. In the northwest there are heavy deposits of red clay containing much potash, but little nitrogenous matter. The soil on the southern plateau is thin, but the

Llano Estacado is covered with a red sandy loam. The principal forest area is in the extreme eastern portion. The pine is the prevailing tree in the coastal plain, long-leaf pine in the lower and short-leaf pine in the higher pine barrens. The deciduous species predominate toward the middle of the state, including oaks, elm, maple, hickory, sycamore, mulberry, sweet gum, ash, and walnut. The Osage orange and the palmetto are plentiful in the eastern part, giving a tropical aspect to the vegetation. In the river-bottoms the characteristic species are cottonwood, pecan, live oak, and cypress. Along the western border of the Black prairie two parallel belts of hardwood forest, chiefly oak, and known as the Cross Timbers, extend southward as far as the Brazos river. Mining bids fair to acquire large proportions. The value of coal increased from \$412,300 in 1891 to over \$2,000,000 in 1907. The production of petroleum practically began in 1897. The yield has increased very rapidly. Gypsum is mined in the north-western part. Cinnabar and salt are mined and some granite, sandstone, and



Seal of Texas.

limestone are quarried. There are a number of valuable mineral springs. The two staple products are cotton and corn, both of which are largely cultivated in the lower or coast region, where the sugar-cane and tobacco also grow luxuriantly. Wheat, rye, oats, and barley thrive best in the hilly regions; and both there and at lower levels fruits in almost endless variety are abundant. The pastures are often covered with the richest natural grasses, and the rearing of cattle is carried on to the greatest advantage. Manufacture is still in its infancy; but the coasting trade is of some importance, and the railway system very extensive. The Baptists are numerically the strongest church, followed closely by the Methodist. These two bodies together contain considerably over two-thirds of the church membership. The Disciples of Christ (Christian), Presbyterians, and Episcopalians are the only other Protestant sects numerically important. At the head of the educational establishments stand the State university, located at Austin, with a medical branch at Galveston, and the Agricultural and Mechanical college at Bryan. There are a large number of denominational institu-

tions. There are also a number of colleges for colored students. The first settlement in Texas was made at Matagorda by the French, who in 1690 were expelled by the Spaniards. It afterward became one of the states of the Mexican confederation. Several colonies of American citizens, invited by the Mexicans, settled in the eastern section, and gradually increased in numbers. Texas then revolted from the Mexican government, and in 1836 declared itself independent. Santa Anna attempted to reduce it, but failed, being himself beaten and taken prisoner at the battle of San Jacinto by General Houston. Texas now managed its own affairs as an independent republic till in 1845 it became one of the United States, and thus gave rise to a war which proved disastrous to Mexico. Texas seceded from the Union (February 1, 1861). Sam Houston was governor and threw all his weight in opposition to secession, but there was no staying the resolve of the people. The state was fortunate in that it was not the scene of much active fighting. The Reconstruction Acts of 1867 placed the state under the military authority, with General Sheridan in command. The carpetbaggers followed and the new reconstruction occupied the next three years. Texas was readmitted to the Union March 30, 1870. In national elections the state has been democratic by overwhelming majorities. Austin is the capital, and other chief towns are Galveston, San Antonio, Houston, Dallas, Waco, etc. Pop. 4,000,000, including about half a million colored and some Indians.

TEXAS, UNIVERSITY OF, a coeducational institution at Austin, Texas, founded upon a grant of 1,000,000 acres of land by the legislature in 1876. It embraces the department of literature, sciences, medicine and arts, offering the degrees of B.A., B. Lit., B.S., M.A., and M.S.; the department of engineering, conferring the degrees of civil engineer and engineer of mines; and the department of law, conferring the degrees of LL.B. and LL.M. New departments in electricity and mechanical engineering were established in 1903, when it was decided to give no degree for undergraduate work after 1906 except that of B.A.

TEX'ARKAN'A, the name of two adjoining cities situated on each side of the boundary between Arkansas and Texas, 145 miles southwest of Little Rock; on the Texas and Pacific, the St. Louis, Iron Mountain and Southern, the St. Louis Southwestern, the Kansas City, Pittsburg and Gulf, and other railroads. Pop. Texarkana in Texas, 6250; Texarkana in Arkansas, 5910.

TEZCU'CO, a town of Mexico, in the department of Mexico, on the eastern shore of the Lake of Tezcuco. In ancient times it was the second city in the kingdom. Here are the remains of three pyramids, each measuring 400 feet along the base of their fronts. Pop. 15,626.

THACKERAY, William Makepeace, English novelist and humorist, was born at Calcutta in 1811, died Dec. 24, 1863. Under the names of George Fitz-Boodle, Esq., or of Michael Angelo Titmarsh, he

contributed to Frazer's Magazine tales, criticisms, verses, etc., which were marked by great knowledge of the world, keen irony, or playful humor. It was in this magazine that *The Great Hogarty Diamond*, *Yellowplush Papers*, and *Barry Lyndon* appeared. In 1840 he published separately the *Paris Sketchbook*, in 1841 the *Second Funeral of Napoleon* and the *Chronicle of the Drum* and in 1843 the *Irish Sketchbook*. None of these writings, however, attained to any great popularity. In 1841 *Punch* was started, and his contributions to that periodical, among others *Jeames's Diary* and the *Snob Papers*, were very successful. In 1846-48 his novel of *Vanity Fair* was published in monthly parts, with illustrations by himself; and long before its completion its author was unanimously placed in the first rank of British novelists. His next novel was the *History of Pendennis*, completed in 1850. In 1851 he delivered a course of lectures in London on the *English Humorists of the 18th century*, which were repeated in Scotland and America, and published in 1853. Another novel, *The History of Henry Esmond* appeared in 1852, and was followed by the *Newcomes* (1855), *The Virginians* (1859), a sort of sequel to *Esmond*; *Lovel the Widower*, *The Adventures of Philip*, and *Denis Duval*, which was left unfinished at his death. In 1855-56 he delivered a series of lectures in the United States—*The Four Georges*, and afterward in England and Scotland. In 1859 he became editor of the *Cornhill Magazine*, in which his later novels and the remarkable *Roundabout Papers* appeared, but he retired from



William Makepeace Thackeray.

that post in 1862. He wrote a good deal of verse, half-humorous, half-pathetic, and often wholly extravagant, but all characterized by grace and spontaneity. He undoubtedly ranks as the classical English humorist and satirist of the Victorian reign, and one of the greatest novelists, essayists, and critics in the literature.

THALBERG (täl-berh), Sigismund, a celebrated pianist, was born in Geneva in 1812. He died April 28, 1871. He left a number of compositions, including sonatas, studies, a concerto, several nocturnes, and other small pieces.

THALER (täl'ér), a silver coin formerly in use in Germany, of the value of about 75c.

THALES (thā'lēz), a native of Miletus in Ionia, or according to some, of Phoenicia, the earliest philosopher of

Greece, and the founder of the Ionian school, was born about 640 B.C. His reputation for learning and wisdom became so great that he was reckoned among the seven wise men, and his sayings were held in the highest esteem by the ancients. He died about B.C. 548. His philosophical doctrines were taught orally, and preserved only by oral tradition, until some of the later Greek philosophers, particularly Aristotle, committed them to writing. He considered water, or rather fluidity, the elemental principle of all things. His philosophical doctrines, are, however, but imperfectly understood.

THALI'A, one of the nine Muses. She was the patron of comedy, and is usually represented with the comic mask and



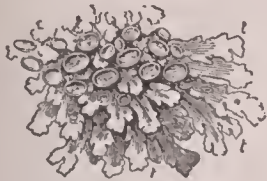
Thalia.—From an antique in the British museum.

the shepherd's crook in her hand. One of the Graces was also called Thalia.

THALLIUM, a metal discovered by Crookes in 1861, in a deposit from a sulphuric acid manufactory in the Hartz. In its physical properties thallium resembles lead, but is slightly heavier, somewhat softer, and may be scratched by the finger-nail. It fuses under a red heat, and is soluble in the ordinary mineral acids. In color it resembles silver, but is less brilliantly white. Its specific gravity varies from 11.8 to 11.9 according to the mechanical treatment to which it has been subjected. The tenacity of the metal is less than that of lead; it is possessed of very considerable malleability. Thallium and its salts imparts an intense green color to a non-luminous flame; when a flame so colored is examined by the spectroscope one very brilliant green band is noticed, somewhat more refrangible than the sodium line D. (See Spectrum.) The salts of thallium are exceedingly poisonous. Small quantities of thallium appear to be widely distributed in nature, the metal frequently occurring in iron and copper pyrites, in native sulphur, etc.

THALLUS

THALLUS, in botany, a solid mass of cells, or cellular tissue without woody fiber, consisting of one or more layers, usually in the form of a flat stratum or



Lichen—*l.* Thallus.

expansion, or in the form of a lobe, leaf, or frond, and forming the substance of the thallogens.

THAMES (temz), the most important river of Great Britain. At London bridge the width of the river is 266 yards, at Woolwich 490 yards, at Gravesend 800 yards, and 3 miles below, 1290 yards. The basin of the Thames has an area of 5400 sq. miles, and belongs entirely to the upper part of the Secondary and to the Tertiary formations. The depth of the river in the fair way above Greenwich to London bridge is 12 to 13 feet, while its tides have a mean range of 17 feet and an extreme rise of 22 feet. By means of numerous canals immediate access is given from its basin to those of all the great rivers of England.

THANA, TANNA, chief town of a district of the same name, Bombay presidency, 21 miles n.e. of Bombay city. It is a favorite residence with the Bombay officials. Pop. 14,456.—The district has an area of 4243 sq. miles. Pop. 908,548, of which 12 per cent are urban.

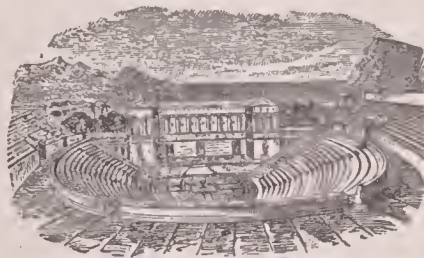
THANKSGIVING DAY, a day specially set apart for the giving of thanks. Since 1864 the president has appointed a day of Thanksgiving (usually the last Thursday of November), and his proclamation has generally been followed by similar proclamations from the governors of several states.

THAR AND PARKAR, British district in the east of Sind, Bombay presidency. Area, 12,729 sq. miles; pop. 203,344. Scarcely a half of the area is under cultivation.

THEA, the tea genus of plants. See Tea.

THEATER, an edifice appropriated to the representation of dramatic spectacles. Among the Greeks and Romans theaters were the chief public edifices next to the temples, and in point of magnitude they surpassed the most spacious of the temples, having in some instances accommodation for as many as from 10,000 to 40,000 spectators. The Greek and Roman theaters very closely resembled each other in their general form and principal parts. The building was of a semicircular form, resembling the half of an amphitheater, and was not covered by a roof. In Greece the semi-circular area was often scooped out in the side of a hill, but Roman theaters were built on the level. The seats of the spectators were all concentric, being arranged in tiers up the semi-circular slope. The stage or place for the players was in front of the seats, being a narrow platform along the straight side of the theater. Behind this rose a high wall resembling the façade of a building, this being intended to repre-

sent any building in front of which the action was supposed to take place. This was called in Greek skēnē (*L. scena*), the stage being called proskēnion (*L. proscaenium*). The semicircular space between the stage and the lowest seats of the spectators was called orchestra, and was appropriated by the Greeks to the chorus and musicians, and by the Romans to the senators. Scenery, in the modern sense of the word, was not employed except in a very rude form, but the stage machinery seems in many cases to have been elaborate; and in particular there was a well-known machine or contrivance of some sort from which deities made their entrance as if from the sky. A good example of an ancient theater is that of Segesta in Sicily.



Theater of Segesta, Sicily—restored.

Modern theaters are all very much alike in their internal construction. The house is divided into two distinct portions, the auditorium and the stage, the former for the spectators, the latter for the actors and scenery, which is often of the most elaborate and realistic kind. The floor of the auditorium is always sloped down from the back of the house to the stage; several tiers of galleries or balconies run in a semicircular or horseshoe form round the house. On the ground floor the front rows of seats are generally reserved as dress or orchestral stalls, and the back part is called the pit. The seats in the galleries rise terrace-wise from the front, so as to allow the persons in the back rows to see on to the stage over the heads of those before them. Immediately in front of the stage is a space occupied by the orchestra. Part of the stage flooring is movable, either as traps through which actors or furniture ascend or descend, or in long narrow pieces which are drawn off at each side of the stage to allow the passage of the rising scenes. Adjoining the stage are the dressing-rooms for the performers, the green-room where they wait when dressed, etc.

THEBES (thēbz), an ancient capital of Egypt, in Upper Egypt, on both sides of the Nile, about 300 miles s.e. of Cairo, now represented by the four villages of Luxor, Karnak, Medinet Habu, and Kurneh, as well as by magnificent ruins, which extend about 9 miles along the river. When Thebes was founded is not known; the period of its greatest prosperity reaches from 1500 to 1000 B.C. The ruins comprise magnificent temples, rock-cut tombs, obelisks decorated with beautiful sculptures, long avenues of sphinxes, and colossal statues. The largest of the temples is that at Karnak, which is about 1½ mile in circumference. The great hall of the temple (or "hall of columns,") the most magnificent in Egypt, measures 329 feet by

THEMISTOCLES

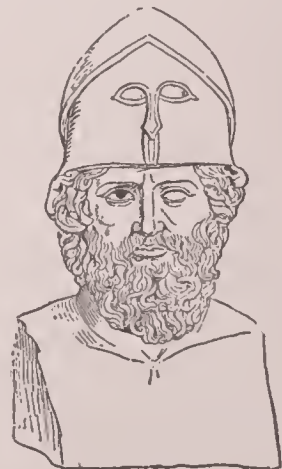
170, and the roof was originally supported by 134 gigantic columns, of which 12 forming the central avenue are 62 feet high and 11 feet 6 inches in diameter, the others, which are in rows on either side, being fully 42 feet in height and 28 in circumference. Within the temple courts are several obelisks of red granite; one—the largest obelisk known—is 108 feet 10 inches high and 8 feet square. Above Karnak are the village and temple of Luxor, the latter at one time connected with Karnak by an avenue of sphinxes (some of which still remain) about a mile long. The Memnonium or temple of Rameses II., and the temple and palace of Rameses III., on the other or left bank of the river, are objects of great interest, both for the grandeur of their architecture and the richness and variety of their sculptures. Here are also the colossal statues of Amenoph III., one of them known as the vocal statue of Memnon. In the interior of the mountains which rise behind are found the tombs of the kings of Thebes, excavated in the rock, the most remarkable being that of Sethi I., discovered by Belzoni, and containing fine sculptures and paintings.

THEBES, a city of ancient Greece, the principal city of Bœotia, the birthplace of Pindar, Epaminondas, and Pelopidas, was situated about midway between the Corinthian Gulf and the Eubœan sea. Cadmus is said to have founded it in 1500 B.C. The modern Thebes or Thiva is an unimportant town of some 4000 inhabitants.

THEISM, the belief or acknowledgment of the existence of God, as opposed to Atheism. See Deism.

THEMIS, goddess of law and justice among the Greeks, was the daughter of Urānus and Gē (Heaven and Earth); according to some, of Helios, or the Sun.

THEMISTOCLES (-klēz), an Athenian commander, born 514 B.C. On the second invasion of Greece by Xerxes, Themistocles succeeded by bribery in obtaining the command of the Athenian



Themistocles.

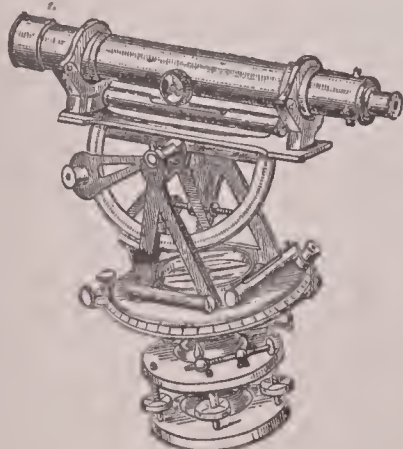
fleet, and in the battle of Salamis which followed (B.C. 480), the Persian fleet was almost totally destroyed, and Greece was saved. The chief glory of the victory is due to Themistocles. Subsequently he was accused of having enriched himself by unjust means, and of being privy to designs for the betrayal

of Greece to the Persians. Fearing the vengeance of his countrymen, he, after many vicissitudes, took refuge at the Persian court. The Persian throne was now (465 B.C.) occupied by Artaxerxes Longimanus, to whom Themistocles procured access, and whose favor he gained by his address and talents, so that he was treated with the greatest distinction. He died in 449, according to some accounts by his own hand.

THEOCRACY, is that government of which the chief is, or is believed to be, God himself, the priests being the promulgators and expounders of the divine commands. The most notable theocratic government of all times is that established by Moses among the Israelites.

THEOCRITUS, a Greek poet, born at Syracuse, who flourished about B.C. 280. We have under his name thirty idyls, or pastoral poems, of which, however, several are probably by other authors. Most of his idyls have a dramatic form, and consist of the alternate responses of musical shepherds. His language is strong and harmonious.

THEODOLITE, a surveying instrument for measuring horizontal and vertical angles by means of a telescope, the movements of which can be accurately marked. This instrument is variously constructed, but its main characteristics continue unaltered in all forms. Its chief features are the telescope, a graduated vertical circle to which it is attached, two concentric horizontal cir-



Theodolite.

cular plates which turn freely on each other, and two spirit-levels on the upper plate to secure exact horizontality, the whole being on a tripod stand. The lower plate contains the divisions of the circle round its edge, and the upper or vernier plate has two vernier divisions diametrically opposite. The plates turn on a double vertical axis. To measure the angular distance horizontally between any two objects, the telescope is turned round along with the vernier circle until it is brought to bear exactly upon one of the objects; it is then turned round until it is brought to bear on the other object, and the arc which the vernier has described on the graduated circle measures the angle required. By means of the double vertical axis the observation may be repeated any number of times in order to ensure accuracy. The graduated vertical circle is for taking altitudes or vertical angles in a similar way. The theodolite is a most

essential instrument in surveying and in geodetical operations.

THEOLOGY is the science which treats of the existence of God, his attributes, and the Divine will regarding our actions, present condition, and ultimate destiny. In reference to the sources whence it is derived theology is distinguished into natural or philosophical theology, which relates to the knowledge of God from his works by the light of nature and reason; and supernatural positive, or revealed theology, which sets forth and systematizes the doctrines of the Scriptures. With regard to the contents of theology it is classified into theoretical theology or dogmatics, and practical theology or ethics. As comprehending the whole extent of religious science, theology is divided into four principal classes, historical, exegetical, systematic, and practical theology. Historical theology treats of the history of Christian doctrines. Exegetical theology embraces the interpretation of the Scriptures and Biblical criticism. Systematic theology arranges methodically the great truths of religion. Practical theology consists of an exhibition, first, of precepts and directions; and secondly, of the motives from which we should be expected to comply with these. Apologetic and polemic theology belong to several of the above-mentioned four classes at once. The Scholastic theology attempted to clear and discuss all questions by the aid of human reason alone laying aside the study of the Scriptures, adopting instead the arts of the dialectician.

THEOPHRASTUS, a celebrated Peripatetic philosopher, was born at Lesbos early in the 4th century, B.C., and studied at Athens, in the school of Plato, and afterward under Aristotle, of whom he was the favorite pupil and successor. On the departure of Aristotle from Athens after the judicial murder of Socrates he became the head of the Peripatetic school of philosophy, and composed a multitude of books—dialectic, moral, metaphysical, and physical. We possess two entire works of his on botany, but only fragments of his other works, such as those on Stones, on the Winds, etc.; and his Characters or sketches of types of character, by far the most celebrated of all his productions. He died in 287 B.C. To his care we are indebted for the preservation of the writings of Aristotle, who, when dying, intrusted them to his keeping.

THEOSOPHY, according to its etymology the science of divine things. But the name of theosophists has generally been applied to persons who in their inquiries respecting God have run into mysticism, as Jacob Böhme, Swedenborg, St. Martin, and others. At the present day the term is applied to the tenets of the Theosophical society, founded in New York in 1875 by a Col. Olcott, the objects of which are: to form the nucleus of a universal brotherhood of humanity, to promote the study of Eastern literature and science, and chiefly to investigate unexplained laws of nature, and the psychical powers of man, and generally the search after divine knowledge—divine applying to the divine nature of the abstract principle,

not to the quality of a personal God. The theosophists assert that humanity is possessed of certain powers over nature, which the narrower study of nature from the merely materialistic stand-point has failed to develop. Leading names are Olcott, A. P. Sinnett, Madame Blavatsky, and Mrs. Annie Besant. Their so-called occult manifestations are akin to those attributed to spiritualism or telepathy, that is, communication between minds at a distance from each other.

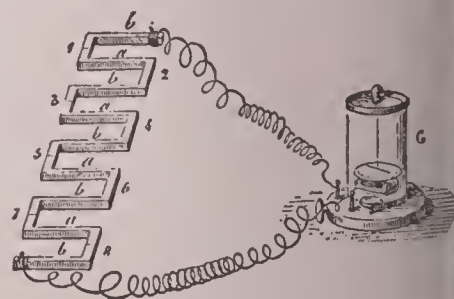
THERAPEUTICS, that department of medicine which treats of remedies in the widest sense.

THERE'SA, St., a religious enthusiast, born at Avila, in Spain, in 1515, who took the veil among the Carmelites at the age of twenty-four. Being dissatisfied at the relaxation of discipline in the order to which she belonged she undertook to restore the original severity of the institute. The first convent of reformed Carmelite nuns was founded at Avila in 1562, and was speedily followed by a number of others. She died in 1582, and was canonized by Pope Gregory XVI. in 1621. She was the author of several works, and all of a devotional nature, among them a very curious life of herself.

THERESIOPEL, a royal free town in Hungary, in the county of Bács, is more properly a district than a town, as it covers, with its numerous suburbs, an area of more than 600 sq. miles. It had manufactures of linen and woolen cloth, dye-works, tanneries, soap-boiling works, etc., and a trade in cattle, horses, hides, and wool. Pop. 81,302.

THERMIDOR, the eleventh month of the year in the calendar of the first French republic. It commenced on the 19th of July, and ended on the 17th of August. See Calendar.

THERMO-ELECTRICITY, electricity produced at the junction of two metals or at a point where a molecular change occurs in a bar of the same metal, when the junction or point is heated above or cooled below the general temperature of the conductor. Thus when wires of bars of metal of different kinds, as bismuth and antimony, are placed in close contact, end to end, and disposed so as to form a periphery or continuous cir-



Thermo-pile.

cuit, and heat then applied to the end or junctions of the bars, electric currents are produced. The principle of the arrangement is shown in the accompanying figure, in which the bars marked a are antimony, those marked b bismuth. The junctions 1, 3, 5, 7 are to be at one temperature, the junctions 2, 4, 6, 8 at another. g is a delicate galvanometer.

which measures the force of the current produced. The thermo-electric battery, or pile, an apparatus much used in delicate experiments with radiant heat, consists of a series of little bars of antimony and bismuth (or any other two metals of different heat-conducting power), having their ends soldered together and arranged in a compact form; the opposite ends of the pile being connected with a galvanometer, which is very sensibly affected by the electric current induced in the system of bars when exposed to the slightest variations of temperature. To the combined arrangement of pile and galvanometer the name of thermo-multiplier is given. Two metal bars of different heat-conducting power having their ends soldered together, and the combined bar then usually bent into a more or less horse-shoe or magnet form for the purpose of bringing their free ends within a conveniently short distance, designated a thermo-electric pair, are much used in thermo-electric experiments. But as the electric current developed in a single pair is very weak, a considerable number are usually combined to form a thermo-electric pile or battery. Bismuth and antimony are the metals usually employed, the difference in electro-motive force being greater between them than between any other two metals conveniently obtainable.

THERMOMETER, an instrument by which the temperatures of bodies are ascertained; founded on the property which heat possesses of expanding all bodies, the rate or quantity of expansion being supposed proportional to the degree of heat applied, and hence indicat-

hence the zero of the scale, or that part marked 0°, is 32° below the freezing-point, and the interval or space between the freezing and boiling points consists of 180°. The zero point is supposed to have been fixed by Fahrenheit at the point of greatest cold that he had observed, probably by means of a freezing mixture such as snow and salt. In France and other parts of Europe, and nowadays in all scientific investigations, the Centigrade or Celsius scale is used. In this the space between the freezing and boiling points of water is divided into 100 equal parts or degrees, the zero being at freezing and the boiling-point marked 100°. Réaumur's thermometer, in use in Germany, has the space between the freezing and boiling points divided into 80 equal parts, the zero being at freezing. For extreme degrees of cold, thermometers filled with spirit of wine must be employed, as no degree of cold known is capable of freezing that liquid, whereas mercury freezes at about 39° below zero on the Fahrenheit scale. On the other hand, spirit of wine is not adapted to high temperatures, as it is soon converted into vapor, whereas mercury does not boil till its temperature is raised to 660° F. As the ordinary thermometer gives the temperature only at the time of observation, the necessity for having an instrument which would show the maximum and minimum temperatures within a given period is easily apparent in all cases connected with meteorology, and various forms of instruments for this purpose have been invented. A common form of maximum thermometer consists of the ordinary thermometer fitted with a



Thermometer scales.

ing that degree. The thermometer consists of a slender glass tube, with a small bore, containing in general mercury or alcohol, which expanding or contracting by variations in the temperature of the atmosphere, or on the instrument being brought into contact with any other body, or immersed in a liquid or gas which is to be examined, the state of the atmosphere, the body, liquid, or gas, with regard to heat, is indicated by a scale either applied to the tube or engraved on its exterior surface. The ordinary thermometer consists of a small tube, terminating in a ball containing mercury, the air having been expelled and the tube hermetically sealed. A scale of temperatures is attached, in which there are two points corresponding to fixed and determinate temperatures, one, namely, to the temperature of freezing water, and the other to that of boiling water. In the thermometer commonly used in Britain and her colonies, the United States, etc., known as Fahrenheit's thermometer, the former point is marked 32° and the latter 212°;

piston which moves easily in the tube. The instrument is placed horizontally, and the piston is pushed along the bore as the mercury advances, and is left at the highest point by the retiring fluid. This point is noted by the observer, who then erects the thermometer, causing the piston to sink to the mercury, the instrument thus being in condition for a fresh experiment. A similar action takes place in the spirit of wine minimum thermometer, the small movable piston being, however, immersed in the fluid and drawn back by the convex surface of the contracting fluid, being left at the point of greatest contraction. The maximum and minimum instruments combined form the self-registering thermometer.

THERMO-PILE. See Thermo-electricity.

THERMOP'YLÆ, a narrow defile in Northern Greece, leading from Thessaly southward, between Mount Ceta and the sea (the Maliac gulf, now the Gulf of Zeitouni), 25 miles north of Delphi, celebrated for its defense by 300 Spartans

together with allies, under Leonidas, against the Persian host under Xerxes, in 480 B.C.

THESEUS (thē'sūs), a mythical king of Athens and famous hero of antiquity, son of Ægeus by Æthra, the daughter of Pittheus of Troezen, in Peloponnesus, of whom many notable deeds are related, as the slaying of the Minotaur and the freeing of Athens from the tribute of seven youths and seven maids annually sent to Crete to be devoured by that monster. As king of Athens he is reputed to have governed with mildness, instituted new laws, and made the government more democratic.

THESSALONIANS, Epistles to the, two New Testament epistles written by St. Paul to the church at Thessalonica, in all probability during his long stay at Corinth, and therefore not very long after the foundation of the Thessalonian church on St. Paul's second missionary journey. A note at the end of each of the epistles in our Authorized Version states that they were written from Athens, but there can be little doubt that this is erroneous, and that they were really written at Corinth. They are the earliest of Paul's writings, and are characterized by great simplicity of style as compared with his other epistles. The genuineness of the first epistle has hardly ever been questioned, but according to the newer criticism, that of the second epistle is more than doubtful.

THES'SALY, the northeastern division of Greece, mainly consisting of a rich plain inclosed between mountains and belonging almost entirely to one river basin, that of the Pencios (Salambria), which traverses it from west to east, and finds an outlet into the Ægean through the vale of Tempe. In the earliest times Thessaly proper is said to have been inhabited by Æolic and other tribes. Subsequently it was broken up into separate confederacies, and seldom exerted any important influence on the affairs of Greece generally. Thessaly was conquered by Philip of Macedon in the 4th century B.C., became dependent on Macedonia, and was finally incorporated with the Roman empire. After the fall of the Byzantine empire it came, with the rest of the imperial dominions, into the hands of the Turks, and till recently formed a part of the Ottoman empire, although the majority of the inhabitants are Greeks. The greater portion of it was in 1881 incorporated with the kingdom of Greece. Capital Larissa. Pop. 294,093.

THETIS, a Greek divinity, a daughter of Nereus and Doris, therefore one of the Nereids. By Peleus, to whom she was married, she became the mother of Achilles.

THIBET (ti-bet'). See Tibet.

THIERRY (ti-cr-ri), Jacques Nicolas Augustin, French historian, born at Blois in 1795, died in 1856. His celebrated work on the Norman conquest of England was published at Paris in 1825, and attained great success both in France and in England. *Lettres sur l'Histoire de la France* appeared in 1827. In 1834 he published, under the title of *Dix Ans d'Etudes*, a series of admirable essays, and about the same time he was summoned by Guizot, then minister of

public instruction, to Paris, and intrusted with the editing of the *Recueil des Monuments Inédits de l'Histoire du Tiers Etat*, for the collection of documents relative to the history of France. In 1840 he published *Récits des Temps Mérovingiens*.

THIERS (ti-är), Louis Adolphe, president of the French republic, statesman and historian, was born at Marseilles 1797, died 1877. During the terrible crisis of 1870-71 Thiers came to the front as the one supreme man in France. After the fall of Paris he was returned to the national assembly, and on February 17, 1871, he was declared chief of the executive power. The first duty imposed upon him as such was to assist in drawing up the treaty of peace, whereby France lost Alsace and Lorraine and agreed to pay an enormous indemnity; his second was to suppress the communist insurrection, which broke out within three weeks of the signing of the treaty. This done, his next task was to free the soil as quickly as possible from



Louis Adolphe Thiers.

the invaders by the payment of the ransom, which also was effected in an incredibly short space of time. The assembly in August, 1871, prolonged his tenure of office and changed his title to that of president. In November, 1872, Thiers declared himself in favor of the republic as a definite form of government for France, and thus to some extent brought about the crisis which resulted in his being deprived of the presidency. He accepted his deposition with dignity, and went quietly into retirement. M. Thiers' chief works are: *Histoire de la Revolution Française* (6 vols., 1823-27), and *Histoire du Consulat et de l'Empire* (20 vols., 1845-62). The latter obtained for him the academic prize of twenty thousand francs.

THIRST, the sensations experienced in animals from the want of fluid nutriment. The sensations of thirst are chiefly referred to the thorax and fauces, but the condition is really one affecting the entire body. The excessive pains of thirst compared with those of hunger are due to the fact that the deprivation of liquids is a condition with which all the tissues sympathize. Every solid and every fluid of the body contains water, and hence abstraction or diminution of the watery constituents is followed by a general depression of the whole system. Thirst is a common symptom of febrile and other diseases.

THIRTY YEARS' WAR, a war in Germany (1618-48), at first a religious

war between the Catholics and the Protestants, and latterly (after 1635), a political struggle between Austria on the one side and France and Sweden on the other. The great commanders in the religious war were Wallenstein and Tilly on the side of the Catholics, and Gustavus Adolphus of Sweden on the side of the Protestants. The war was ended by the Peace of Westphalia. See Germany.

THISBE. See Pyramus and Thisbe.

THISTLE, the common name of a prickly plant. There are numerous species. The common cotton-thistle attains a height of from 4 to 6 feet. It is often regarded as the Scotch thistle, but it is doubtful whether the thistle which constitutes the Scottish national badge has any existing type, though the stemless thistle is in many districts of Scotland looked on as the true Scotch thistle. Some species are cultivated in gardens from the beauty of their flowers. Thistles sow themselves readily by their winged seeds.

THISTLE, Order of the, a Scottish order of knighthood, sometimes called the order of St. Andrew. It was instituted by James VII. (James II. of England) in 1687, when eight knights were nominated. It fell into abeyance during the reign of William and Mary, but was revived by Queen Anne in 1703. The insignia of the order consist of a gold collar composed of thistles interlaced with sprigs of rue; the jewel, a figure of St. Andrew in the middle of a star of eight pointed rays, suspended from the



Order of the Thistle—Star, jewel, badge, and collar.

collar; the star, of silver and eight-rayed, four of the rays being pointed, while the alternate rays are shaped like the tail-feathers of a bird, with a thistle in the center surrounded by the Latin motto *Nemo me impune lacessit*; and the badge, oval, with the motto surrounding the figure of St. Andrew. The order consists of the sovereign and sixteen knights besides extra knights (princes), and a dean, a secretary, the lion-king-at-arms, and the gentleman usher of the green rod.

THOMAS, St., also called Didymus, one of the twelve apostles, said to have been a native of Antioch. The particu-

lars of his life are unknown, the chief fact known regarding him being his doubts as to the living reality of Christ after the resurrection. He figures largely in the apocryphal gospels, and tradition has it that he acted as a Christian missionary in Ethiopia, Egypt, India, and even America.

THOMAS, George Henry, American general, was born in Virginia in 1816, and at the age of twenty entered the military academy at West Point, passing into the artillery as sub-lieutenant at the age of twenty-four. He took part in the Mexican war (1846-47); was appointed professor at West Point in 1850; recalled to active service in 1855, and employed in Texas against the Indians. When the war of secession broke out Thomas had attained the rank of colonel and being appointed brigadier-general of volunteers in August, 1861, was some months later sent into Kentucky, where, in the following year, he defeated Zollikofer. As major-general of volunteers he took part in the battle of Murfreesborough, where he greatly distinguished himself; while at the bloody battle of Chickamauga, in September, 1863, he saved the federal army from destruction by his stubborn resistance after the defeat of the federal right. In the campaign of 1865 he defeated Hood, and compelled the confederates to raise the siege of Nashville, for which he received the thanks of congress, and was raised to the rank of major-general in the regular army. He died in 1870.

THOMAS A KEMPIS, that is, Thomas of Kempen, his birthplace, in the archbishopric of Cologne, was born about 1380. At the age of twenty he retired to an Augustine convent near Zwolle, in Holland, where he took the vows, and where, in 1471, he died superior of the convent. He was a voluminous writer. His works (the printed ones all in Latin) consist of sermons, exhortations, ascetic treatises, hymns, prayers, etc. His name however, would hardly be remembered were it not for its connection with the celebrated devotional work called *The Imitation of Christ* (*De Imitatione Christi*), a work which has passed through thousands of editions in the original Latin and in translations. The authorship of this book has long been a disputed point. It is generally ascribed to a Kempis, but often to Gerson, chancellor of the University of Paris at the end of the 14th and beginning of the 16th century.

THOMAS AQUINAS. See Aquinas.

THOMAS, Theodore, German-American orchestral conductor, was born in Esens, East Friesland in 1835. He came with his parents to America in 1845, and played first violin in the first American concert tour of Jenny Lind. In 1861 he began the formation of his famous orchestra, and in 1864 gave his first symphony concerts in New York. In 1866 he instituted his summer-night festivals. From 1878 to 1890 he was the conductor of the Brooklyn Philharmonic society, and in 1890 he went to Chicago. The orchestra which he built up in Chicago became one of the recognized great orchestras of the world. Orchestra hall, Chicago, was erected by its citizens in honor of his memory. He died in 1905.

THOMSON, Sir Charles Wyville, naturalist, born in 1830 in Linlithgowshire; died 1882. In the dredging expeditions of the Lightning and Porcupine he took part, afterward publishing in *The Depths of the Sea*, the substance of his discoveries in regard to the fauna of the Atlantic. In 1872 he was appointed scientific chief of the Challenger expedition, which was absent from England 3½ years, during which time 68,890 miles were surveyed. On his return he was knighted, and intrusted by the government with the task of drawing up a report on the natural history specimens collected during the expedition. But he only lived to publish a preliminary account of the expedition.

THOMSON, James, poet, was born in 1700, at Ednam, near Kelso, in Scotland. He went in 1725 to London, where *Winter*, the first of his poems on the seasons, was published in 1726. In 1727 he published his *Summer*, his *Poem to the Memory of Sir Isaac Newton*, and his *Britannia*, in 1728 his *Spring*, and in 1730 his *Autumn*. He brought on the stage his tragedy of *Sophonisba* (1729). He now (1738) produced his tragedy of *Agamemnon*, and a third entitled *Edward and Eleanor*. In 1740 he composed the masque of *Alfred* in conjunction with Mallet; but which of them wrote the famous song, *Rule, Britannia*, is not known. In 1745 his most successful tragedy, *Tancred and Sigismunda*, was brought out and warmly applauded. The following year he produced his *Castle of Indolence*, a work in the Spenserian stanza. For a few years he held by deputy the comfortable post of surveyor-general of the Leeward islands, and he died in 1748.

THOMSON, James, poet, was born at Port-Glasgow, Scotland, in 1834. In 1860 he became a contributor to the *National Reformer*, in which was published, under the signature "B. V.," *The Dead Year*, *To our Ladies of Death*, and the poem by which he is best known, *The City of Dreadful Night*. He died in 1882.

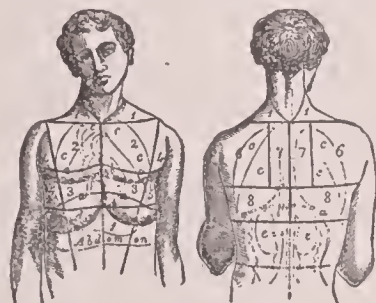
THOMSON, Sir W., Lord Kelvin, one of the greatest mathematicians and physicists of the present day, was born at Belfast in 1824. In 1846 he was appointed professor of natural philosophy in the University of Glasgow, a post which he held till 1899. The same year he became editor of the *Cambridge and Dublin Mathematical Journal*, to which he contributed valuable papers on the mathematical theory of electricity, being also a distinguished contributor to *Liouville's Journal de Mathématiques*. Among the most important of his contributions to electrical science are the construction of several delicate instruments for the measurement and study of electricity. It was in connection with submarine telegraphy that his name became most generally known, his services being rewarded, on the completion of the Atlantic cable of 1866, with knighthood and other honors. In 1892 he was created a baron. He has greatly increased our knowledge of magnetism and heat, and has invented an improved form of mariner's compass now in extensive use. His work in thermo-dynamics is of the greatest value. He was the first to rec-

ognize the importance of the doctrine of the conservation of energy. Lord Kelvin's many scientific papers have been published in book form, as follows: *Electrostatics and Magnetism*, *Mathematical and Physical Papers*, *Popular Lectures and addresses*. He is the author, in conjunction with Professor P. T. Tait, of a *Treatise on Natural Philosophy*. He was president of the British association at Edinburgh in 1871, and of the Royal society in 1890-95. Lord Kelvin visited America in 1884, 1897, and 1902. He died in 1907.

THOR, son of Odin by Jörd (the earth), the Jupiter of the Teutons, the God of thunder. Thursday has its name from him. See *Northern Mythology*.

THORACIC DUCT. See *Lymph*.

THORAX, the chest, or that cavity of the human body formed by the spine, ribs, and breast-bone, situated between the neck and the abdomen, and which contains the pleura, lungs, heart, etc. The name is also applied to the corresponding portions of other mammals, to the less sharply defined cavity in the lower vertebrates, as birds, fishes, etc., and to the segments intervening between



Thorax in man.

Thoracic regions denoted by thick black lines. 11, Right and left humeral. 22, do. subclavian. 33, do. mammary. 44, do. axillary. 55, do. subaxillary. 66, do. scapular. 77, do. interscapular. 88, do. superior dorsal or subscapular. —Viscera or contents of thorax, the position of which is indicated by dotted lines. aa, Diaphragm; b, heart; c, lungs; d, liver; e, kidneys; f, stomach.

the head and abdomen in insects and other Arthropoda. In serpents and fishes the thorax is not completed below by a breastbone. In insects three sections form the thorax, the pro-thorax bearing the first pair of legs; the mesothorax, bearing the second pair of legs and the first pair of wings; and the metathorax, bearing the third pair of legs and the second pair of wings.

THOREAU, (tho'rō), Henry David, American writer, born at Boston in 1817. Besides contributing to the *Dial* and other periodicals, he published *A Week on the Concord and Merrimac Rivers* (1849), and *Walden, or Life in the Woods* (1854). After his death appeared *Excursions in Field and Forest*, *The Maine Woods*, *Cape Cod*, and *A Yankee in Canada*. Thoreau was a friend of Emerson, and imbibed much of his spirit and method of thought. He died in 1862.

THORIUM, the metal of which thorina is the oxide, discovered by Berzelius. It is in the form of a heavy metallic powder, has an iron-gray tint, burns in air or oxygen, when heated, with great splendor, and is converted into thorina or oxide of thorium. It unites ener-

getically with chlorine, sulphur, and phosphorus. Hydrochloric acid readily dissolves it, with the evolution of hydrogen gas. The symbol of Thorium is Th, and the atomic weight 116.



Henry D. Thoreau.

THORN. See *Hawthorn*.

THORWALDSEN (tor'våld-sèn), Albert Bartholomew, a celebrated sculptor, born at Copenhagen, November 19, 1770. It was not until 1803, that he became at all widely known. Then he received a commission from Sir Thomas Hope to execute in marble a statue of Jason, which the sculptor had modeled. His fortune was now made. Commissions flowed in upon him, new creations from his hand followed in quick succession, and his unsurpassed abilities as a sculptor became everywhere recognized. In 1819 he returned to Denmark, and his journey through Germany and his reception at Copenhagen resembled a triumph. He died March 24, 1844. The Thorwaldsen museum, opened in 1846, contains about 300 of the works of the sculptor. Thorwaldsen was eminently successful in his subjects chosen from Greek mythology, such as his Mars, Mercury, Venus, etc. His religious works, among which are a colossal group of Christ and the Twelve Apostles, St. John Preaching in the Wilderness, and statues of the four great prophets, display almost superior grandeur of conception. Chief among his other works are his statues of Galileo and Copernicus, and the colossal lion near Lucerne, in memory of the Swiss guards who fell in defense of the Tuileries.

THOU (tō), Jacques Auguste de, a French statesman and historian, born in 1553, died in 1617. Henry IV. employed him in several important negotiations, and in 1593 made him his principal librarian. In 1595 he succeeded his uncle as chief-justice, and during the regency of Mary de' Medici he was one of the directors-general of finance. His greatest literary labor was the composition in Latin of a voluminous *History of his own Times* (*Historia sui Temporis*),

comprising the events from 1545 to 1607, of which the first part was made public in 1604. To this work, which is remarkable for its impartiality, he subjoined interesting Memoirs of his own Life.

THOUSAND AND ONE NIGHTS. See Arabian Nights.

THOUSAND ISLANDS, a group of small islands numbering about 1800 in the St. Lawrence immediately below Lake Ontario. They partly belong to Canada and partly to the state of New York, and have become a popular summer resort.

THRACE, or THRACIA, a name applied at an early period among the Greeks to a region lying north of Macedonia. By the Romans this country was regarded as divided into two parts by the Hæmus (or Balkan), the northern of which was called Mœsia and the southern Thrace. Abdera, the birthplace of Democritus and Protagoras; Sestos, on the Hellespont, celebrated in the story of Hero and Leander; and Byzantium, on the peninsula on which Constantinople now stands, were the places the most worthy of note.

THRESHING-MACHINE, a machine for separating grain from the straw, and in which the moving power is that of horses, oxen, wind, water, or steam. The threshing-machine was invented in Scotland in 1758 by Michael Stirling, a farmer in Perthshire; it was afterward improved by Andrew Meikle, a millwright in East Lothian, about the year 1776. Since that time it has undergone various improvements. The principal feature of the threshing-machine as at present constructed, is the three rotary drums or cylinders, which receive motion from a water-wheel, or from horse or steam power. The first drum which comes into operation has projecting ribs called beaters on its outer surface, parallel to its axis. This drum receives a very rapid motion on its axis. The sheaves of corn are first spread out on a slanting table, and are then drawn in with the ears foremost between two feeding rollers with parallel grooves. The beaters of the drum act on the straw as it passes through the rollers, and beat out the grain. The threshed straw is then carried forward to two successive drums or shakers, which, being armed with numerous spikes, lift up and shake the straw so as to free it entirely from the loose grain lodged in it. The grain is made to pass through a grated floor, and is generally conducted to a winnowing-machine connected by gearing with the threshing-machine itself, by which means the grain is separated from the chaff. Improved machines on the same principle, many of them portable, are extensively used in England and America, those of the latter country being in particular very light and effective. The portable steam threshing-machine now common in England and in many parts of Scotland has no feeding-rollers, the corn being fed direct to the first drum, which revolves at a very high speed and separates the grain by rubbing against a grating fitted around the drum rather than by direct beating. It gets through far more work than the ordinary stationary mill. With a portable engine the machine can be moved

from field to field, and also from farm to farm, thus being capable of performing the threshing-work of a wide district for the whole season.

THREAD, a slender cord consisting of two or more yarns, or simple spun strands, firmly united together by twisting. The twisting together of the different strands or yarns to form a thread is effected by a thread-frame or doubling and twisting machine, which accomplishes the purpose by the action of bobbins and flyers. Thread is used in some species of weaving, but its principal use is for sewing. The manufacture of sewing thread in the United Kingdom both for home use and export is very extensive. As a general rule the thread manufactured for home use, and for export to the United States, is much superior to that made for other markets, which is of an inferior quality. The thread made for home use is commonly known as six-cord, and that for export as three-cord thread. The chief seat of the cotton thread manufacture in Scotland is Paisley, in England Manchester. Linen thread is manufactured largely in Ireland.

THREAD-WORMS, the name for thread-like intestinal worms which occur in great numbers in the rectum of children particularly.

THREE-COLOR PROCESS, a photo-mechanical process of reproducing in color. The process consists in making three photograph negatives of the same subject through three different color screens representing the three primary colors, red, yellow, and blue. The accuracy of the finished picture depends, to a great extent, upon the exactness of the register. The process is largely mechanical and the result is only approximately correct, though increased care is being taken in the manipulation and better results are constantly obtained.

THRESHER-SHARK, also called the Fox-shark, a genus of sharks containing but one known species, with a short conical snout, and less formidable jaws than the white shark. The upper lobe of the tail fin is very elongated, being nearly equal in length to the rest of the body, and is used as a weapon to strike with. Tail included, the thresher attains a length of 13 feet. It inhabits the Atlantic and the Mediterranean, and is sometimes met with on the coasts of Britain. See Shark.

THROAT, the anterior part of the neck of an animal, in which are the œsophagus and windpipe, or the passages for the food and breath. See Larynx, Œsophagus, Trachea, Diphtheria, Croup, etc.

THRUSH, the name applied popularly to several insectorial birds. The true thrushes form a family of dentirostral passerine birds, including the song-thrush or throstle, the missel-thrush, the redwing, etc. They feed upon berries, small molluscs, worms, etc. Their habits are mostly solitary, but several species are gregarious in winter. They are celebrated on account of their powers of song; and are widely diffused, being found in all the quarters of the globe. The song-thrush is especially distinguished by its sweet song. The color is a brown of different shades on

the upper parts, the chin being white, and the belly and under tail-coverts a grayish-white. Its average length is 9 inches. The eggs, numbering five, are blue, spotted with black. The nest is



Red-winged thrush.

large and basin-shaped, composed of roots, mosses, etc., smoothly plastered inside with clay. The thrush family also includes the fieldfare, redwing, and ring-ouzel.

THRUSH, a disease common in infants who are ill fed. The name is also applied to an abscess in the feet of horses and some other animals.

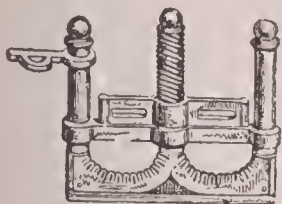
THUCYDIDES (thö-sid'-dēz), the greatest of all the Greek historians, was born in Attica about 471 B.C. He was for a time a prominent commander during the Peloponnesian war, which forms the subject of his great work. For many years he suffered exile (being accused of remissness in duty); but appears to have returned to Athens the year following the termination of the war, namely, in B.C. 403. He is said to have met a violent death, probably a year or two later, but at what exact time and whether in Thrace or Athens, is not known. His history consists of eight books, the last of which differs from the others in containing none of the political speeches which form so striking a feature of the rest, and is also generally supposed to be inferior to them in style. As a historian Thucydides was painstaking and indefatigable in collecting and sifting facts, brief and terse in narrating them. His style is full of dignity and replete with condensed meaning. He is unsurpassed in the power of analysing character and action, of tracing events to their causes, of appreciating the motives of individual agents and of combining in their just relations all the threads of the tangled web of history.

THUGS, the name applied to a secret and once widely-spread society among the Hindus, whose occupation was to waylay, assassinate, and rob all who did not belong to their own caste. This they did, not so much from cupidity as from religious motive, such actions being deemed acceptable to their goddess Kālī.

THULE (thö'le), the name given by the ancients to the most northern country with which they were acquainted. According to Pytheas it was an island six days' voyage to the north of Britannia, and accordingly it has often been identified with Iceland. Some have imagined it to be one of the Scotch islands, others the coast of Norway.

THUMB-SCREW

THUMB-SCREW, a former instrument of torture for compressing the thumbs. It was employed in various



Scotch thumb-screw, time of Charles I.

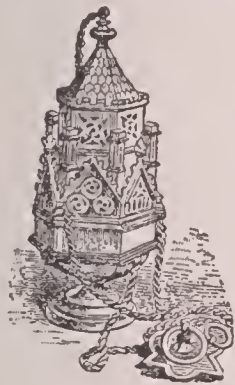
countries, Scotland in particular. Called also Thumbkins.

THUNDER. See Lightning.

THUNDER-FISH, a species of fish of the family Siluridae, found in the Nile, which, like the torpedo, can give an electric shock.

THURGAU (tur'gou), a canton in the northeast of Switzerland, bounded mainly by the Lake of Constance and the cantons of Zürich and St. Gall; area, 381 sq. miles; capital, Frauenfeld. The whole canton belongs to the basin of the Rhine, to which its waters are conveyed chiefly by the Thur and its affluents, and partly also by the Lake of Constance, including the Untersee. Pop. 113,110.

THURIBLE, a kind of censer of metal, sometimes of gold or silver, but more commonly of brass or latten, in the shape of a covered vase or cup, per-



Thurible.

forated so as to allow the fumes of burning incense to escape. It has chains attached, by which it is held and swung at high mass, vespers, and other solemn offices of the Roman Catholic church.

THURINGERWALD (tū'ring-ēr-vált), or **FOREST OF THURINGIA**, a mountain chain in the center of Germany, stretching southeast to northwest for about 60 miles. Its culminating points are the Beerberg and the Schneekopf, which have each a height of about 3220 feet. The mountains are well covered with wood, chiefly pine. The minerals include iron, copper, lead, cobalt, etc.

THURINGIA (thō-rin'ji-a), a region of Central Germany situated between the Harz mountains, the Saale, the Thüringerwald, and the Werra, and comprising great part of Saxe-Weimar, Saxe-Coburg-Gotha, and other small adjoining states.

THUR'MAN, Allen Granbery, American political leader, was born in Lynchburg, Va., in 1813, and in 1819 was taken by his parents to Chillicothe, Ohio. In 1845-47 he was a democratic mem-

ber of congress, then resumed his law practice, and from 1851 to 1856 was on the bench of the Ohio supreme court, after December, 1854, as chief justice. In 1867 he was the democratic candidate for governor of Ohio, but was defeated by Rutherford B. Hayes. From 1869 to 1881 he was a member of the United States senate. In the forty-sixth congress he was elected president pro tempore of the senate. In 1881 he was appointed by President Garfield a member of the International monetary conference at Paris. In 1888 he was nominated by acclamation for Vice-president on the Cleveland ticket, which was defeated by Harrison and Morton. He died in 1895.

THURSDAY (that is, "Thor's day"), the fifth day of the week, so called from the old Teutonic god of thunder, Thor. See Thor.

THWAITES, Reuben Gold, American historical writer, was born in Dorchester, Mass., in 1853. In 1866 he removed to Wisconsin. From 1876 to 1886 he was managing editor of The Wisconsin State Journal, at Madison. In 1886 he was elected secretary of the State Historical Society of Wisconsin, and editor of the society's Collections. He edited the Wisconsin Historical Collections, Chronicles of Border Warfare, and The Jesuit Relations (73 vols.), his work on the last being one of the most careful and scholarly pieces of historical editing ever done in America. He also published: Historic Waterways, The Story of Wisconsin, The Colonies, 1492-1750; Stories of the Badger State, Daniel Boone and Père Marquette, and George Rogers Clark.

THYESTES (thī-es'tēz), in Greek mythology, son of Pelops and Hippodamia, and grandson of Tantalus. Having seduced the wife of his brother Atreus, the latter, in revenge, served up to him the body of his own son at a feast.

THYME (tim), a small plant, a native of the south of Europe. It has a strong aromatic odor, and yields an essential oil which is used for flavoring purposes.

THYMUS GLAND, a ductless temporary organ situated in the middle line of the body. After the end of the second year of life it decreases in size, and almost or wholly disappears at puberty. It is covered in front by the breast-bone, lies on the front and sides of the windpipe. Its functions are still undetermined.

THYROID CARTILAGE. See Larynx.

THYROID GLAND, a ductless structure in man which covers the anterior and inferior part of the larynx and the first rings of the windpipe. It is of a reddish color, and is more developed in women than in men. It may become abnormally enlarged, as in goitre. Its use is not at all clear, but it probably exerts some influence on the blood and circulation, especially in childhood.

THYRSUS, among the Greeks, a wand or spear wreathed with ivy leaves, and with a pine-cone at the top, carried by the followers of Bacchus as a symbol of devotion. In ancient representations it appears in various forms.

TIA'RA, originally the cap of the Persian kings. The tiara of the pope is

TIBET

a high cap, encircled by three coronets with an orb and cross of gold at the top, and on two sides of it a chain of precious stones. The mitre alone was first adopted by Damasus II. in 1048. It afterward had a plain circlet of gold put around it. It was surmounted by a coronet by Boniface VIII. The second coronet was added by Benedict XII., the third coronet by Urban V.



Various forms of thyrsus, from ancient vases.

TÍBER, a celebrated river of Italy, which rises in the Apennines, in Tuscany, and, after a general southerly course of about 240 miles, falls into the Mediterranean by two mouths. It traverses the city of Rome, here forming the island anciently called Insula Tiberina. About ninety miles of its course are navigable for small vessels; those of about 140 tons burden reach Rome.

TIBE'RIAS. See Galilee, Sea of.

TIBERIUS, in full, Tiberius Claudius Nero Cæsar, a Roman emperor, born B.C. 42, was the son of Tiberius Claudius, of the ancient Claudian family, and of Livia Drusilla, afterward the wife of the emperor Augustus. Tiberius became consul in his twenty-eighth year, and was subsequently adopted by Augustus as his heir. In A.D. 14 he succeeded to the throne without opposition. Tacitus records the events of the reign, including the suspicious death of Germanicus, the detestable administration of Sejanus, the poisoning by that minister of Drusus, the emperor's son, and the infamous and dissolute retirement of Tiberius (A.D. 27) to the Isle of Caprea, in the Bay of Naples, never to return to Rome. The death of Livia in A.D. 29 removed the only restraint upon his actions, and the destruction of the widow and family of Germanicus followed. Sejanus, aspiring to the throne, fell a victim to his ambition in the year 31; and many innocent persons were destroyed owing to the suspicion and cruelty of Tiberius, which now exceeded all limits. He died in March, 37.

TIBET', or **THIBET'**, a country occupying the south portion of the great plateau of Central Asia, lying between lon. 73° and 101° e., and lat. 27° and 36° n., and extending east and west from Cashmere and the Karakorum range to the frontiers of China; area about 700,000 sq. miles. Its plains average above 10,000 feet in height, and many of its mountains have twice that altitude. In Tibet nearly all the great rivers of South and East Asia take their rise (Indus, Brahmaputra, Hoang-ho, Yang-

tse-kiang, etc.), and there are numerous salt and fresh-water lakes, situated from 13,800 to 15,000 feet above the sea-level. The climate is characterized by the excessive dryness of the atmosphere, and the severity of the winter. Tibet does a large trade with China, exchanging gold-dust, incense, idols, and European and Indian goods, for tea, silks, and other Chinese produce. The capital is Lhasa. The form of government is a hierarchy. The religion is Buddhism in a form known as Lamaism, of which Tibet is the principal seat. The lamas or priests form a large proportion of the population, and live in monasteries; the two grandlamas being regarded as the religious and political heads of the state. Remains of an earlier creed exist in the Boupo, a religion evolved from Shamanism, but much influenced by Buddhism, and frequently confounded with the old school of the Buddhists. The inhabitants are of an amiable disposition, but much averse to intercourse with foreigners, few of whom have been able to gain admittance to the country. Their manners and mode of life are rude. Polyandry is a common custom. The language is allied to Chinese, and has been written and used in literature for 1200 years. Tibet was governed by its own princes till the commencement of the 18th century, but since 1720 it has been a dependency of China. A Chinese functionary is always stationed at the residence of the grand lama, and a Chinese governor with a military force is stationed in each of the principal towns. Pop. about 5,000,000.

TICINO, a canton in the south of Switzerland; area, 1088 sq. miles. The northern and greater part of this canton is an elevated and mountainous region, the Splügen, St. Bernardin, and Mount St. Gothard forming its northern boundary. Pop. 142,719.

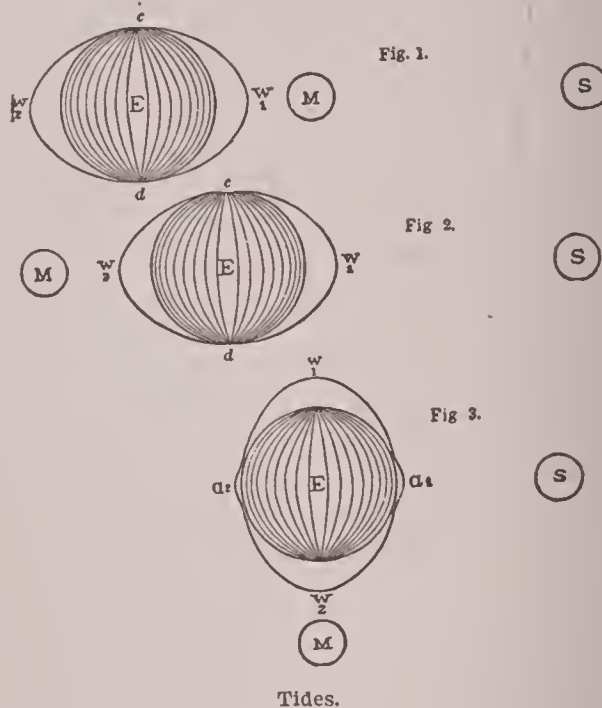
TICKNOR, George, American historian, born at Boston in 1791, died there in 1871. In 1849 he published a *History of Spanish Literature* (three vols. 8vo., New York), corrected and enlarged editions being subsequently published. It was at once recognized by scholars as a work of value, and has been translated into Spanish and German. After some works of minor interest he produced in 1863 a *Memoir of Prescott*, the historian, with whom he had maintained a close friendship.

TICKS, a family of parasitic animals, possessing oval or rounded bodies, and mouths, in the form of suckers, by which they attach themselves to dogs, sheep, oxen, and other mammals. Birds and reptiles are also annoyed by the attacks of certain species.

TIDES, the rising and falling of the water of the sea, which occurs periodically, as observed at places on the coasts. The tide appears as a general wave of water, which gradually elevates itself to a certain height, then as gradually sinks till its surface is about as much below the medium level as it was before above it. From that time the wave again begins to rise; and this reciprocating motion of the waters continues constantly, with certain variations in the height and in the times of attaining the greatest degree of height and of

depression. The alternate rising and falling of the tide-wave are observed to take place generally twice in the course of a lunar day, or of 24 hours 49 minutes of mean solar time, on most of the shores of the ocean, and in the greater part of the bays, firths, and rivers which communicate freely with it. The tides form what are called a flood and an ebb, a high and low water. The whole interval between high and low water is often called a tide; the water is said to flow and to ebb; and the rising is called the flood-tide and the falling the ebb-tide. The rise or fall of the waters, in regard to elevation or depression, is exceedingly different at different places, and is also variable everywhere. The interval between two succeeding high-waters is also variable. It is shortest about new and full moon,

diminishing the lunar tide, according as the sun's place in the heavens coincides with the line of the moon's attraction, or the reverse. It is this difference which produces what are known as spring tides and neap tides. Spring tides occur at new and full moon, and are the result of the gravitating influence of both sun and moon; neap tides occur when the moon is in her quarters, and are not so high as the spring tides, the lunar influence being lessened by the sun's force acting in a direction at right angles to it. The accompanying figures illustrate the theory of the tides, *e* being the earth, *m* the moon, *s* the sun, *w*₁, *w*₂ the water raised up by attraction on the opposite sides of the earth. Fig. 1 shows spring tide at new moon, Fig. 2 spring tide at full moon, the low tides being at *c* and *d*. Fig. 3 illustrates the neap tides,



Tides.

being then about 12 hours 19 minutes; and about the time of the moon's quadratures it is 12 hours 30 minutes. But these intervals are somewhat different at different places. Tides are caused by the attraction which the sun and moon exert over the water of the earth. The moon is the nearest of the heavenly bodies to the earth, and the mobile nature of water leads it to yield readily to the attractive influence. Those parts of the waters directly under the moon's vertical path in the heavens are drawn out toward the moon. At the same time the moon attracts the bulk of the earth, and, as it were, pulls the earth away from the water on the surface furthest from it, so that here also the water is raised, although not quite so much as on the nearer side. The waters being thus heaped up at the same time on these two opposite parts of the earth, and the waters situated half-way between them being thus necessarily depressed, two high and two low tides occur in the period of a little more than one revolution of the earth on its axis. The sun's influence upon the tides is evidenced in its either increasing or

a, *a*₂ being small tides caused by the sun alone. The interference of coasts and irregularities in the ocean beds cause the great variations as to time and range in the actual tides observed at different places. In some places, as in the German ocean at a point north of the Straits of Dover, a high tide meets low water, and thus maintains perpetual mean tide. In the case cited high water transmitted through the Straits of Dover encounters low water transmitted round the north of Scotland, and vice versa. The interval of time at any place between noon and the time of high water on the day of full or new moon is called the establishment of the port.

TIECK (tēk), Ludwig, German writer, born at Berlin in 1773. At Jena in 1799-1800 he entered on friendly relations with the Schlegels, Novalis, Brentano, and others, and through this association arose what has been dominated as "the Romantic School of Germany." In 1817 he visited England, where he collected material for his *Shakespeare*; and on his return resided at Ziebingen till 1819, when he removed to Dresden. From this period his writings, as exemplified

in his Tales, bear the true stamp of genius. These tales were ultimately published complete in twelve volumes (Berlin, 1853), the principal being *Dichterleben* (A Poet's Life—Shakespeare); *Der Tod des Poeten* (The Poet's Death—Camoens); the *Witches' Sabbath*, and *Aufbruch in den Cevennen* (Revolt in the Cevennes), an incomplete work. In 1826 he published his *Dramaturgische Blätter* (two vols., Breslau). His study of Shakespeare resulted in *Shakespeare's Vorschule* (two vols., Leipzig, 1823–29); and the continuation of the German translation of Shakespeare commenced by Schlegel. His last story of importance was *Vittoria Accorombona* (1840). He died at Berlin on the 28th April, 1853.

TIENTSIN, a town in the north of China, and the river-port of Pekin, with which it communicates by the Pei-ho river. This river is only navigable by native craft, and large vessels have their cargoes transhipped outside the mouth of the Taku roadstead. From October to February the river is frozen, but in the open season a large import trade is carried on, chiefly in European goods (Tientsin being one of the treaty ports). The principal imports are cotton, sugar, opium, paper, and tea; exports, dates, cotton, camel's wool, and coal. The Taku forts were taken by the British and French in 1860, and the capture of Pekin followed. During the Boxer uprising in 1900 the foreign settlement suffered from the besieging Boxers and the city from the relieving forces of the allies. Pop. 950,000.

TIER'RA (or Terra) **DEL FUE'GO** ("Land of Fire"), a large group of islands at the southern extremity of South America, separated from the mainland by the Strait of Magellan. It consists of one large island and numerous smaller islands, with a total area of about 32,000 sq. miles. The eastern part of the group belongs to the Argentine Republic, the western part to Chile. These islands consist chiefly of mountains covered with perpetual ice and snow, or clothed with stunted forests, mainly of evergreen-beech. *Tierra del Fuego* was discovered by Magalhaens in 1520, and named "Land of Fire" from the numerous fires he saw on its coasts during the night. Pop. about 2,100.

TIERS-ETAT (ti-är-zā-tā; "third estate"), the name given in the ancient French monarchy to the third order of the nation, which, together with the nobility and clergy, formed the *états généraux* (states-general). It consisted of the deputies of the bourgeoisie, that is, the free inhabitants of the towns and communes who did not belong to either of the other two estates. In 1789 the states-general, or rather the tiers-état by itself, assumed the name of the National assembly.

TIFLIS, capital of a government of the same name and of Russian Caucasasia, is situated on the river Kur, 500 feet above the level of the Black sea. Pop. 160,645.—The government has an area of 15,000 sq. miles; is very mountainous; produces cereals, fruits, etc., in the valleys, and has immense forests of excellent timber. Pop. 1,040,943.

TIFFANY, Charles Louis, American merchant, was born at Killingly, Conn.,

in 1812, and removed to New York City in 1837, and embarked in the jewelry business. In 1850 he made a large fortune in buying diamonds when they had fallen 50 per cent in value owing to the general revolutionary movement throughout Europe. During the civil war Mr. Tiffany placed his store and resources at the disposal of the government and it became for a time one of the principal depots of military supplies. Mr. Tiffany was made a member of the French Legion of Honor in 1878 and received at various times decorations from other foreign rulers. He was a liberal patron of the fine arts, and did much to encourage and promote the study and knowledge of art in America. He died in 1902.

TIF'FIN, the county-seat of Seneca co., Ohio, 40 miles southeast of Toledo; on the Sandusky river, here spanned by several bridges, and on the Baltimore and Ohio, the Pennsylvania, and the Cleveland, Cincinnati, Chicago and St. Louis railroads. Pop. 13,400.

TIGER, a well-known carnivorous animal, possessing in common with the lion, leopard, etc., five toes on the front feet and four on the hinder feet, all the toes being furnished with strong retractile claws. The tiger is about the height of the lion, but the body is longer and the head rounder. It is of a bright fawn-color above, a pure white below, irregularly crossed with black stripes. The tiger attains its full development in India, the name of "Bengal tiger" being generally used as synonymous with those



Royal tiger.

specimens which appear as the typical and most powerful representatives of the species. The tiger also occurs in Java and Sumatra. In habits it is far more active and agile than the lion, and exhibits a large amount of fierce cunning. It generally selects the neighborhood of water-courses as its habitat, and springs upon the animals that approach to drink. "Man-eaters" are tigers which have acquired a special liking for human prey. The natives destroy tigers by traps, pits, poisoned arrows, and other means. Tiger-hunting is a favorite Indian sport.

TIGER-BEETLE, a species of coleopterous insects which are swift and active in their movements, and prey upon other insects.

TIGER-FLOWER, a Mexican bulbous plant frequently cultivated in gardens on account of the magnificence of its flowers. The stem is about 1 foot in height, with sword-shaped leaves. The flowers are large, of a singular form, and very evanescent. The petals are of a fine orange-red toward the extremity; whitish or yellowish and beautifully spotted at the base.

TIGER-LILY, a native of China, common in gardens, having scarlet flowers turned downward, the perianth being



Tiger-lily.

reflexed. It is remarkable for having axillary buds on the stem. The bulbs are eaten in China and Japan.

TIGER-MOTH, a genus of insects, the caterpillars of which are well known under the popular name of "woolly bears." The moth is colored red and brown. The larvæ feed on dead-nettles.

TIGRIS, a river in Western Asia, having its principal source in the Turkish province of Diarbekir, on the southern slope of the Anti-Taurus, a few miles to the east of the Euphrates. It flows generally southeast, passes Diarbekir, Mosul, and Bagdad, and joins the Euphrates somewhat more than 100 miles from its embouchure in the Persian gulf, after a course of 1100 miles, the united stream being known as the Shatt-el-Arab. Large rafts, supported by inflated skins, are much in use for the transport of goods. Between the Tigris and the Euphrates lies the celebrated region Mesopotamia.

TILDEN, Samuel Jones, American statesman, was born at New Lebanon, N. Y., in 1814. He became chairman of the democratic state committee in 1866. The Tweed "ring" in New York City dreaded him, and in 1869 attempted to remove him from his chairmanship. Tilden then became the soul of the legal attacks upon the ring and worked for the removal of the corrupt judges who were their tools. In 1874 he was elected governor of the state by the democrats. In 1876 the national democratic convention nominated him for the presidency, the republicans nominating governor Hayes of Ohio. The result was the disputed election of 1876–77, when each party secured about the same number of electors outside of the three southern states of Florida, South Carolina, and Louisiana. In this emergency Tilden consented to the appointment of an extra-constitutional body, an "electoral commission," to decide disputed cases, the decisions of which were to hold good unless reversed by concurrent vote of the two houses. The commission decided all the cases in

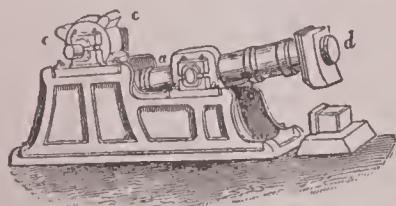
favor of the republican candidates, and Tilden was defeated. He continued in retirement until his death, which took place at Greystone, N. Y., on August 4, 1886.

TILES, a term applied to a variety of articles made either for ornament, such as inlaid paving tiles (see Encaustic Tiles and Mosaic), or for use, as in tile-draining (see Draining) and roofing, which last are made similarly to bricks, and of similar clay.

TILLY, Johann Tserklaes, Count of, one of the most celebrated generals of the 17th century, born about 1559, in Walloon Brabant. On the outbreak of the Thirty Years' war he led the army destined to crush the Protestants in Bohemia. He defeated them on the White mountains (November, 1620), and in 1622 conquered the Palatinate, defeating several Protestant commanders. On the 27th August, 1626, he defeated Christian IV. of Denmark in Brunswick, and compelled him to return to his own country. In 1630 Tilly succeeded Wallenstein as generalissimo of the imperial troops. His most celebrated exploit is the bloody sack of Magdeburg, May 10, 1631. Gustavus Adolphus met him at Breitenfeld, near Leipzig, September 7, and Tilly was entirely beaten, and was himself wounded. In a subsequent engagement with the Swedes on the Lech a cannon-ball shattered his thigh, and caused his death in 1632.

TILLMAN, Benjamin Ryan, American politician, was born in Edgefield co., S. C., in 1847. He became the leader of the farming element in the democratic party, received the support of the Farmers' Alliance, and in 1890, was elected governor of the state. He was reelected in 1892, and in 1895 was elected United States senator being reelected to that office for a second time in 1901. He was active in both "free-silver" campaigns, in 1896 and 1900, as one of the most radical supporters of the candidacy of W. J. Bryan.

TILT-HAMMER, a large and heavy hammer worked by steam or water power, and used in forgings. It has been largely superseded by the steam-hammer, but is still advantageously used with light work. Cogs (as at c c in cut)



Tilt-hammer.

being brought to bear on the tail of the hammer (a), its depression causes the head (d) to be elevated, which, when the tail is liberated, falls with considerable force by its own weight.

TIMBER, a general term applied to wood used for constructive purposes, as that of the different kinds of fir and pine, the oak, ash, elm, beech, sycamore, chestnut, walnut, mahogany, teak, etc. The sap in timber is the great cause of its decay; hence, at whatever period timber is felled, it requires to be thor-

oughly seasoned before being used in building. The object of seasoning is partly to evaporate the sap, and partly to reduce the dimensions of the wood so that it may be used without further shrinking. Timber seasons best when placed in dry situations, where the air has a free circulation round it. Wood for building becomes compact and durable after two or three years' seasoning. But this mode of seasoning only removes a portion of the aqueous and volatile matter from the wood, the extractive and soluble portion still remains, and is liable to ferment on the reabsorption of moisture. It is often extremely difficult to preserve wood which is to be exposed to the weather, or is to remain in a warm and moist atmosphere. No entirely satisfactory process has yet been discovered for the preservation of timber and the prevention of dry-rot. The most successful method consists in extracting the sap, in excluding moisture, and in impregnating the vessels of the wood with antiseptic substances such as creosote. The sap may be extracted by water seasoning, in which the green timber is immersed in clear water for about two weeks, being then seasoned in the usual manner. It has also been proposed to extract the sap by means of an air-pump. The charring of timber on the outside is commonly supposed to increase its durability, but experiments on this subject do not agree. The exclusion of moisture by covering the surface with a coating of paint, varnish, tar, etc., is a well-known preservative of wood exposed to the weather. But painting is no preservative against the internal or dry rot. Only wood thoroughly seasoned should be painted. Resinous woods are more durable than others, and the impregnation of wood with tar, bitumen, and other resinous substances undoubtedly promotes its preservation. Wood impregnated with drying oils becomes harder and more capable of resisting moisture. Common salt (chloride of sodium) is a well-known preservative. The immersion of seasoned timber in sea-water is generally admitted to promote its durability. Chloride of zinc and creosote are extensively used for the preservation of wood.

TIMBREL, a kind of drum, tabor, or tabret, which has been in use from the highest antiquity, and is much the same as the tambourine.

TIME, in music. See Music.

TIME, the general idea of successive existence, or that in which events take place, space being that in which things are contained. Relative time is the sensible measure of any portion of duration, often marked by some phenomenon, as the apparent revolution of the celestial bodies, more especially of the sun, or the rotation of the earth on its axis. Time is divided into years, months, weeks, days, hours, minutes, and seconds; but of these portions the year and days only are marked by celestial phenomena. (See Day, Year.) The instruments employed for measuring time are clocks, watches, chronometers, hour-glasses, and dials; but the three first are those chiefly used.

TIME STANDARD, primarily for the

convenience of the railroads, a standard of time was established by mutual agreement in 1883, by which trains are run and local time regulated. According to this system, the United States, extending from 65° to 125° west longitude, is divided into four time sections, each of 15° of longitude, exactly equivalent to one hour, commencing with the 75th meridian. The first (eastern) section includes all territory between the Atlantic coast and an irregular line drawn from Detroit to Charleston, S. C., the latter being its most southern point. The second (central) section includes all the territory between the last-named line and an irregular line from Bismarck, N. D., to the mouth of the Rio Grande. The third (mountain) section includes all territory between the last-named line and nearly the western borders of Idaho, Utah, and Arizona. The fourth (Pacific) section covers the rest of the country to the Pacific coast. Standard time is uniform inside each of these sections, and the time of each section differs from that next to it by exactly one hour. Thus at 12 noon in New York City (eastern time), the time at Chicago (central time) is 11 o'clock a.m.; at Denver (mountain time), 10 o'clock a.m. and at San Francisco (Pacific time), 9 o'clock a.m. Standard time is 16 minutes slower at Boston than true local time, 4 minutes slower at New York, 8 minutes faster at Washington, 19 minutes faster at Charleston, 28 minutes slower at Detroit, 18 minutes faster at Kansas City, 10 minutes slower at Chicago, 1 minute faster at St. Louis, 28 minutes faster at Salt Lake City, and 10 minutes faster at San Francisco.

TIMOR, the largest and most eastern of the Lesser Sunda islands, in the Asiatic archipelago, southeast of Celebes is politically divided between Holland and Portugal; area, 11,000 sq. miles. The natives are partly Papuans, partly Malays. The trade, chiefly in the hands of Chinese, is carried on mostly through Koepang. The exports are sandal-wood, trepang, wax, horses, tortoise-shell, birds'-nests, etc. Pop. about 500,000.

TIMOTHY, a disciple of St. Paul, was born in Lycaonia, Asia Minor, probably at Lystra, of a Gentile father and Jewish mother. When St. Paul visited Lystra on his second missionary journey, Timothy became an active fellow-worker with the apostle, and he accompanied him and Silas in the further course of their mission. He went with Paul to Philippi and Berea, and remained alone in the latter city, afterward rejoining the apostle at Athens, from which city he was sent to Thessalonica. After remaining there some time he again joined Paul at Corinth. Five years later, he is found with his master at Ephesus, whence he was sent with Erastus into Macedonia and Achaia to prepare the churches for Paul's meditated visit. Timothy met the apostle again in Macedonia, and preceded him on his journey to Jerusalem. He again appears at Rome with Paul at the time when the epistles to the Colossians, Philippians, and Philemon were written. Timothy was on one occasion left at Ephesus when Paul went into Macedonia (1 Tim. i. 3). Tradition

makes him the first bishop of Ephesus. He is said to have been martyred in the reign of Domitian or Nerva.

TIMOTHY, Epistles to, two books of the New Testament attributed to St. Paul. These epistles, along with that to Titus, are called the pastoral epistles, as to the genuineness of which there has been considerable controversy. By the early Christian fathers they were almost universally accepted as genuine, and their genuineness is also supported by external testimony. They were, however, rejected by Marcion, Basilides, and other Gnostic heretics. In modern times both views have been ably advocated. Their genuineness is chiefly attacked on the grounds that their style differs from that of the acknowledged epistles of St. Paul, that the heresies alluded to in the epistles betray a later age, that the ecclesiastical polity of the epistles is too complete to belong to the time of the apostles, and that it is difficult to find any part of the apostle's life to which they can be assigned. Biblical critics generally meet the last difficulty by assigning them to a period after the close of the narrative in the Acts, the second epistle to Timothy being written while St. Paul was undergoing a second imprisonment in Rome.

TIMOTHY-GRASS, a hard coarse grass with cylindrical spikes from 2 to 6 inches long. It is used mixed with other grasses for permanent pasture, and grows best in tenacious soils. It is extensively cultivated throughout Great Britain and also in North America. Swine refuse it.

TIMUR, called also Timur Beg and Timur Lenk (that is, Timur the Lame), and, by corruption, Tamerlane, a celebrated oriental conqueror of Mongol or Tartar race, born in the territory of Kesh, near Samarcand, in 1336. By degrees he conquered Persia, and the whole of Central Asia, and extended his power from the great wall of China to Moscow. He invaded India (1398), which he conquered from the Indus to the mouths of the Ganges, massacring, it is said, on one occasion 100,000 prisoners. On his way from India to meet the forces of Bajazet, the Turkish sultan, he subjugated Bagdad, plundered Aleppo, burned down the greater part of Damascus, and wrested Syria from the Mamelukes, after which he overran Asia Minor with an immense army. Bajazet's army was completely defeated on the plain of Ancyra (Angora) in 1402, and the sultan was taken prisoner. The conquests of the Tartar now extended from the Irtish and Volga to the Persian Gulf, and from the Ganges to the Grecian archipelago. He was making mighty preparations for an invasion of China when death arrested his progress at his camp at Otrar, beyond the Sir-Daria, in 1405, and his empire immediately fell to pieces.

TIN, a hard, white, ductile metal; atomic weight 118. Tin appears to have been known in the time of Moses; and the Phœnicians traded largely in the tin ores of Cornwall. The mountains between Galicia and Portugal, and those separating Saxony and Bohemia, were also productive of tin centuries ago, and still continue unexhausted. Tin occurs in

the Malay peninsula, the island of Banca, India, Mexico, Chile, Peru, the United States, Australia, etc. There are only two ores of tin; the native binocide, called tin-stone, and the double sulphide of tin and copper, called tin-pyrites. The former is the only ore used for obtaining metallic tin. It occurs in various crystalized forms, in deep lodes blended with several other metals, as arsenic, copper, zinc, and tungsten, when it is known as mine-tin; or, in disseminated masses in alluvial soil, in which state it is called stream-tin. Mine-tin, when reduced to the metallic state, yields block-tin while stream-tin yields a purer sort called grain-tin. The ore is first ground and washed, and then roasted in a reverberatory furnace to expel the sulphur and arsenic. Mixed with limestone and fuel, it is again fused in a furnace for about eight hours, the earthy matters flowing off with the lime, while the oxide of tin, reduced to a metallic state, falls by its own weight to the bottom, and is drawn off. The tin, still impure, is again moderately heated, when it melts and flows off into the refining basins, leaving the greater part of the foreign metals in a solid state. The molten tin is stirred in order to disperse the gases, and, when partially cool, it separates in zones, the upper consisting of nearly pure tin, while the under is so impure that it must be melted again. The upper layer is removed, cast into blocks, and sold as block-tin, the purest specimens being called refined-tin. Tin-pyrites, the other ore of tin, contains from 14 to 30 per cent of tin, and is found at St. Agnes in Cornwall, in Saxony, and in Bolivia. Pure tin has a fine white color like silver. It has a slightly disagreeable taste, and emits a peculiar sound when rubbed. Its hardness is between that of gold and lead, and it is very malleable. Specific gravity 7.28. Melting point about 230° C. Tin is very flexible, and when bent emits a crackling sound, sometimes called the cry of tin. It loses its luster when exposed to the air, but undergoes no further alteration. Tin will unite with arsenic and with antimony, but does not readily combine with iron. Combined with copper it forms bronze, bell-metal, and several other useful alloys. With lead it forms pewter and solder of various kinds. Tin-plate is formed by dipping thin plates of iron into melted tin; they are afterward cleaned with sand and steeped for twenty-four hours in water acidulated by bran or sulphuric acid. Tin is principally employed in the formation of alloys. Its oxides are used in enamelling, and for polishing the metals, and its solution in nitro-muriatic acid is an important mordant in the art of dyeing, rendering several colors, particularly scarlet, more brilliant and permanent.

TIN'AMOU, the name given to a genus and family of birds occurring in South America, and allied in some respects to the ostrich and emeu. They somewhat resemble a partridge, and vary in size from that of a pheasant down to that of a quail. The great tinamou is about 18 inches long, and inhabits the forests of Guiana.

TIN'DALL, or **TYNDALE**, William, a

martyr to the Reformation, born about 1484 in Gloucestershire, and educated at Oxford. He removed to London, where he began his English version of the New Testament, and subsequently proceeded to Germany, visiting Luther at Wittenberg. Having completed his translation he got it partly printed in quarto at Bologne; but he had to flee from this town, and the complete work was printed in octavo at Worms. The greater part was sent to England, and the prelates Warham and Tunstall collected all copies they could seize or purchase, and committed them to the flames. The only fragment of the quarto edition known to exist is preserved in the British museum. Tindall also translated the Pentateuch, and subsequently Jonah. In 1530 he took up his residence at Antwerp. In 1535 he was thrown into prison at Vilvorde near Brussels, and being found guilty of heresy he was strangled in 1536 and his body burned at the stake.



Great tinamou.

TINDER, any substance artificially rendered readily ignitable but not inflammable. Before the invention of chemical matches it was the chief means of procuring fire. The tinder, ignited by a spark from a flint, was brought into contact with matches dipped in sulphur. Tinder may be made of half-burnt linen, and of various other substances, such as amadou, touchwood, or German tinder.

TIN-FOIL, pure tin, or an alloy of tin and lead, beaten into leaves about 1/100th part of an inch thick. It is often used to cover up articles that are not to be exposed to atmospheric moisture.

TINNEVELLI, a town in the southeast of India, in the presidency of Madras, the largest town of the district of the same name. Pop. 40,469.—The district, which occupies the extreme southeastern corner of the Indian peninsula, has an area of 5381 sq. miles, and pop. 1,916,095.

TIN-PLATE. See Tin.

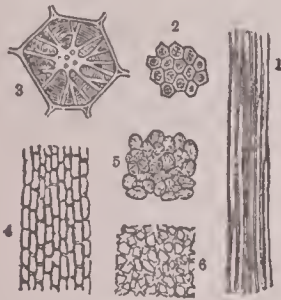
TINTORETTO, the surname of a Venetian historical painter, Giacomo or Jacopo Robusti, born at Venice in 1518, died there in 1594. He painted many works for his native city, among which are a Last Judgment, the Israelites Worshipping the Golden Calf, the Miracle of St. Mark (his masterpiece), etc. His portrait, by himself, is in the Louvre; and there are many of his paintings in Germany, Spain, France, and England. Equal in several respects to Titian or Paul Veronese, he wants the

dignity of the former, and the grace and richness of composition of the latter. His manner of painting was bold, with strong lights, opposed by deep shadows. His execution was very unequal.

TIP'PERAH, a district of British India, in the Chattagong division of Bengal; area, 2491 sq. miles. Pop. 1,782,935.

TIPPERA'RY, an inland county in Ireland, in the province of Munster, bounded by King's county, Queen's county, Kilkenny, Waterford, Cork, Limerick, Clare, and Galway; area, 1659 sq. miles, or 1,061,731 acres, of which a fourth is under tillage. The soil is extremely fertile; the chief crops are oats, potatoes, and wheat. Pop. 159,754.—Tipperary, the county town, situated on the river Arra, 98 miles s.w. of Dublin. Pop. 6281.

TISSUES, (1) in animal anatomy, the texture or grouping of anatomical elements of which the systems of organs are composed. Thus in special histology we speak of muscular tissue, or flesh; osseous tissue, or bone; adipose tissue, or fat; cartilaginous tissue, or gristle; pigmentary tissue, or coloring matter seen in the skin, etc.; areolar, cellular, or connective tissue, widely distributed



Vegetable tissue.

1, Prosenchyma or woody tissue. 2, Horizontal section of prosenchymatous tissue. 3, Do. of a single cell, showing the successive layers of deposit in the interior which give hardness and firmness to the wood of plants. 4, Cylindrical parenchyma. 5, Round or elliptical parenchymatous tissue. 6, Spongiform or stellate tissue.

in every part of the body, and serving to bind together and consolidate other parts and tissues. (2) In vegetable anatomy, the minute elementary structures of which the organs of plants are composed. Plant tissues are composed of elementary membrane and elementary fibre, and the principal forms under which they exhibit themselves constitute cellular tissue, fibrous tissue, and vascular tissue.

TITANIUM, a metal discovered in 1791. It is found combined with oxygen in several minerals, and occurs especially in iron ores, which hence receive the name of titaniferous iron ores. Titanium is a dark green, heavy, amorphous powder, and some authorities doubt its metallic character. The ores of this metal include menachanite, from Menachan in Cornwall, where it was originally found; iserine, from the river Iser in Silesia; sphene, rutile, brookite, etc.

TITANS, in Greek mythology, the sons and daughters of Urānus (Heaven) and Gē (Earth). They were twelve in number, six sons and six daughters. They rose against Urānus and deposed him,

raising Cronus, one of their number, to the throne. They were afterward overcome by Zeus, and thrown into Tartarus.

TITHES, the tenth part of the increase yearly arising from the profits of lands, the stock upon lands, and the industry of the occupants, allotted to the clergy for their maintenance. The custom of giving and paying tithes is very ancient, and was legally enjoined by Moses (Lev. xxvii., Deut. xiv., and elsewhere). In 578 Charlemagne established the payment of tithes in those parts of the Roman empire under his sway, dividing them into four parts; one to maintain the edifice of the church, the second to support the poor, the third the bishop, and the fourth the parochial clergy. Similar laws were afterward enacted in various states of Western Europe. Their payment was first enjoined in England by a constitutional decree of a synod held in 786. Offa, king of Mercia, in 794 made a law giving the tithes of all his kingdom to the church, and similar laws were enacted by Athelstan and Canute. The first mention of tithes in statute law is in 1285.

TITIAN (tish'-i-an), or **TIZIANO VECCELIO** (tit-si-ā'no ve-chel'li-ō), one of the most distinguished of the great Italian painters, and head of the Venetian school, was born at Pieve de Cadore, in the Carnic Alps, in 1477. In 1512 he completed the unfinished pictures of Giovanni Bellini in the Sala del Gran Consiglio at Venice, and the senate were so pleased that they gave him an important office. To this period are attributed his pictures of the Tribute Money and Sacred and Profane Love. In 1514 he painted a portrait of Aristo at Ferrara, and after his return to Venice, he painted an Assumption of the Virgin (1516), considered one of the finest pictures in the world; it is now in the Academy of the Fine Arts in Venice. About 1528 he produced his magnificent picture, The Death of St. Peter the Martyr. Many of his master-pieces, such as The Sleeping Venus, Christ in the Garden, St. Margaret and the Dragon,



Titian

are to be found in Spain where they were painted during his sojourn there. In 1537 he painted an Annunciation, and in 1541 he produced The Descent of the Holy Ghost on the Apostles, The Sacrifice of Abraham, and David and Goliath. In 1543 he painted his picture of The Virgin and San Tiziano. He died of the plague in 1576, aged ninety-nine. Titian excelled as much in landscape as in figure-painting, was equally great in

sacred and profane subjects, in ideal heads and in portraits, in frescoes and in oils; and though others may have surpassed him in single points, none equalled him in general mastery. As a colorist he is almost unrivaled, and his pictures often reach the perfection of sensuous beauty.

TITLE-DEEDS, in law, are the documentary evidences of ownership of real property.

TITMOUSE, **TIT**, or **TOMTIT**, the name given to a number of dentirostral insessorial birds inhabiting most parts of the world. They are very active little birds, continually flitting from branch to branch, devouring seeds and insects and not sparing even small birds when they happen to find them sick and are able to put an end to them. Their notes are shrill and wild. They build in the hollows of trees, in walls, etc. The great



Blue titmouse, male and female.

titmouse is between five and six inches long, and inhabits Britain and Europe generally. Other British species are the blue titmouse, the long-tailed tit, the coal-tit, and the marsh-tit. The crested titmouse and the bearded titmouse are comparatively rare in England, but common on the continent. Several species are North American, some of them known as chickadee.

TITUS, or in full, **TITUS FLAVIUS SABINUS VESPASIANUS**, a Roman emperor, born A.D. 40, was the eldest son of the Emperor Vespasian. He became sole emperor in 79, and showed himself as an enlightened and munificent ruler, distinguished by benevolence and philanthropy. He died on the 13th September, 81, after a reign of a little over two years and two months. His brother Domitian was strongly suspected of having poisoned him.

TITUS, a disciple and assistant of the apostle Paul, and the person to whom one of the canonical epistles of the New Testament is addressed. He was a gentile by origin, and probably a native of Antioch. He labored with Paul in Asia Minor, Macedonia, and Crete, and is said to have been the first Christian bishop of Crete.

TITUS, Epistle to, one of the three pastoral epistles of the New Testament (the remaining two being those addressed to Timothy), believed to have been written by St. Paul after his first imprisonment at Rome. The topics handled are the same which we find in the other two kindred epistles. See Timothy, Epistles to

TOAD, the name applied to various genera of tailless amphibians. Toads have a thick bulky body, covered with warts or papillæ. They have no teeth, and the tongue is fixed to the front of the

mouth, but the posterior extremity is free and protrusible. The hind feet are but slightly webbed. They leap badly, and generally avoid the water, except in the breeding season. Their food consists of insects and worms. Toads have a most unprepossessing aspect and outward appearance. The toad is easily tamed, and exhibits a considerable amount of intelligence as a pet. It lies torpid in some hole during winter. Insects are caught by a sudden protrusion of the tongue, which is provided with a



Common American toad.

viscous secretion. There are some ten species of toads in North America. The toad is extremely tenacious of life, but experiments have conclusively shown that there is no truth in the oft-repeated stories of the creature being able to support life when inclosed in solid rock for immense periods of time. Dr. Buckland has shown that when excluded from air and food, frogs and toads, in virtue of their slow circulation and cold-blooded habits, might survive about a year or eighteen months at most.

TOBACCO, a very important plant, belonging to the natural order *Atropaceæ*, or nightshade order. The introduction of the use of tobacco forms a singular chapter in the history of mankind. According to some authorities smoking was practiced by the Chinese at a very early date. At the time of the discovery of America, tobacco was in frequent use among the Indians, and the practice of smoking, which had with them a religious character, was common to almost all the tribes. The name tobacco was either derived from the term used in Hayti to designate the pipe, or from *Tabaca* in St. Domingo, whence it was introduced into Spain and Portugal in 1559 by a Spaniard. It soon found its way to Paris and Rome, and was first used in the shape of snuff. Smoking is generally supposed to have been introduced into England by Sir Walter Raleigh, but Camden says the practice was introduced by Drake and his companions on their return from Virginia in 1585. It was strongly opposed by both priests and rulers. Pope Urban VIII. and Innocent IX. issued bulls excommunicating such as used snuff in church, and in Turkey smoking was made a capital offense. In the canton of Bern the prohibition of the use of tobacco was put among the ten commandments, immediately after that forbidding adultery. The Counterblast or denunciation written by James I. of England is a matter of history. All prohibitions, however, regal or priestly, were of no avail, and tobacco is now the most extensively

used luxury on the face of the earth. The most commonly cultivated tobacco plant is glutinous, and covered with a very short down; the stem upright, 4 or 5 feet high, and branching; the leaves are lanceolate, from 6 to 18 inches long; the flowers are terminal and rose-colored. A less esteemed species is distinguished by a short yellowish-green corolla. All the tobacco plants are natives of America, and this continent has continued the principal producer, the chief tobacco-growing country being the United States, and the chief localities being Virginia and Kentucky. It was first cultivated in Holland early in the 17th century, and soon extended to other countries, including Austria, Germany, Russia, the Balkan peninsula, Asiatic Turkey, France, British India, Cuba, Brazil, the Philippine Islands, Japan, and Australia. Tobacco owes its principal properties to the presence of a most poisonous alkaloid named nicotine. In the cultivation of tobacco the object is to render the leaves as large and as numerous as possible. When the leaves become brittle the plants are cut close to the ground, and afterward carried to the drying-shed, where they are



Virginian tobacco.

hung up in lines to sweat and dry. When perfectly dry the leaves are stripped from the stalks and made into small bundles, which are subsequently stowed in casks for exportation. In the manufacture of tobacco the leaves are first thoroughly cleansed with salt and water. The midrib of the leaf is then removed; the leaves are again sorted, and the large ones set apart for making cigars. The leaves may either be cut finely for use in pipes, as in the case with shag tobacco, or they are moistened and pressed into cakes, which are designated *cavendish*; or they are pressed into sticks, as *negrohead*; or again the leaves may be spun in the form of a rope of greater or less thickness; the smallest twist is called *pigtail*. The midribs, separated in the first process of manufacture, are preserved to be converted into snuff. Cigars and cheroots are favorite forms of manufactured tobacco. As the best leaf is grown in Cuba, so also are the best cigars made there. The leaf used for the manufacture of Manilla cheroots is grown chiefly on the island of Luzon. The United States exports tobacco annually to the value of more than \$30,000,000. The total crop

in the United States is estimated at about 660,000,000 lbs. annually, the value of which is about \$55,000,000.

TOBACCO-PIPE. See Pipe (Tobacco).

TOBIT, Book of, one of the Old Testament apocryphal books, rejected by the Jews and Protestants, but included in the Roman Catholic canon. It contains an account of some remarkable events in the life of Tobit, a Jew of the tribe of Naphtali, carried captive to Nineveh, and his son Tobias.

TOBOL, a river of Siberia, which rises in the west slope of the Ural mountains, in the government of Orenburg, and joins the Irtysh at the town of Tobolsk, after a course of about 550 miles.

TOBOLSK', capital of the government of Tobolsk, Western Siberia, on the Tobol where it joins the Irtysh. It has a cathedral, arsenal, barracks, prison for Siberian exiles, a theater, etc. Pop. 20,130.—The government comprises the northwestern part of Siberia, and has an area of 564,825 sq. miles, and a pop. of 1,283,000.

TOCQUEVILLE (tok-vêl), Alexis Charles Henri Clarel de, French writer, born in 1805, died 1859. Being commissioned by the government to proceed to the United States to report upon the penitentiary system, the results of his inquiry were published in 1833 under the title *Du Système Pénitentiaire aux Etats-Unis et de son Application en France*. His most celebrated work, however, was *La Démocratie en Amérique* (Democracy in America, two vols. Paris, 1834), which was translated into the principal European languages. In 1849 he accepted the portfolio of foreign affairs, but soon resigned it. After the coup d'état of 1851 he lived retired from public affairs. He wrote also *L'Ancien Régime et la Révolution*; *Histoire Philosophique du Règne de Louis XV.*, etc.

TODDY, the name given by the English to the sweet juices which are extracted from the different species of the palm tribe, including the cocoa-nut tree. When newly drawn from the tree it is a sweet, cool, refreshing beverage, but when it has been allowed about ten or twelve hours to ferment it becomes highly intoxicating. The name toddy is also given to a mixture of whisky, hot water, and sugar.



Roman senator wearing the toga.

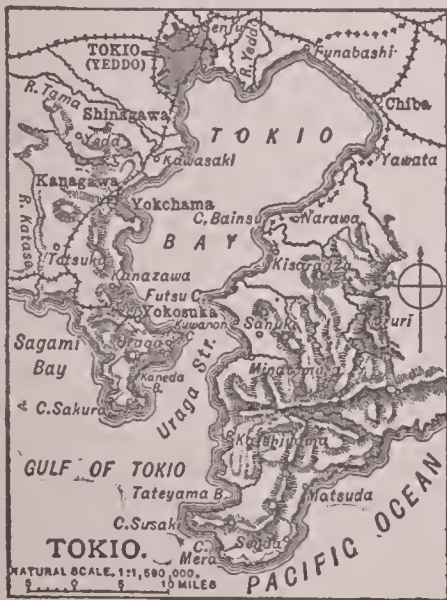
TOGA, the principal outer garment of wool worn by Roman citizens. It covered the whole of the body except the right arm, and it was originally worn by both

sexes until the matrons adopted the stola. The toga virilis, or manly gown, was assumed by Roman youths when they attained the age of fourteen. The variety in the color, the fineness of the wool, and the ornaments attached to it indicated the rank of the citizen; generally it was white. Under the emperors the toga went out of fashion.

TOGOLAND, a German protectorate on the Slave coast, Guinea, acquired in 1885. It has a coast-line of 32 miles, and stretches about 200 miles inland. Pop. 300,000.

TOKENS, pieces of money current by sufferance, and not coined by authority; or coins only nominally of their professed value. In England tokens first came into use in the reign of Henry VIII. owing to the want of authorized coins of lower value than a penny. Stamped tokens of lead, tin, and even leather were issued by vintners, grocers, and other tradesmen during the time of Elizabeth, and were extensively circulated, being readily exchanged for authorized money at the shops where they were issued. A currency of this kind (mostly of copper) was much used in Britain during the close of the 18th century.

TOKIO, formerly called Yeddo, the capital of Japan, and chief residence of the mikado, is situated on a bay of the same name, on the s.e. coast of Hondo, the largest of the Japanese islands, and is connected by rail with Yokohama and Kanagawa. The bulk of the houses are of wood, but there are many new buildings of brick and stone, and an imperial palace has recently been erected near the center, as also public offices, etc. The greater part of the town is flat, and



intersected by numerous canals crossed by bridges. The streets are generally narrow and irregular. Gas has been introduced, and the sanitary arrangements have been improved. Education is well organized, and there are nearly 700 private and elementary schools. Tokio contains the imperial university, and it may be considered the center of the political, commercial, and literary activity of Japan. Pop. 1,440,121.

TOLEDO, a city of Spain, in New

Castile, capital of a province of the same name, on a rocky eminence washed by the Tagus, and 1820 feet above the sea, 55 miles southwest of Madrid. It is the see of an archbishop, who is primate of Spain. Toledo contains a ruined alcazar, or palace and fortress, dating from 1551, and a Gothic cathedral, one of the grandest in the world, completed in 1492 in the style of the 13th century; also other interesting buildings. The Toledo sword-blades, renowned for many centuries, are manufactured in a large building (a government establishment) on the Tagus, about a mile from the town. Pop. 20,251. Province; area, 5620 sq. miles. Pop. 370,012.

TOLEDO, a flourishing city of Lucas co., Ohio, at the western extremity of Lake Erie, 65 miles s.s.w. of Detroit. Toledo is the terminus of the Miami and Erie, and the Wabash and Erie canals, and the center of several extensive railway lines. Exports include flour, grain, cattle, beef, pork, hides, wool, tobacco, and timber. There are large wagon-works, machine-shops, foundries, flour-mills, and manufactories of tobacco, flax, cotton, and chandlery. Pop. 1909, estimated at 193,000.

TOLERATION. See Religious Liberty.

TOLIMA, a state of the Republic of Colombia, intersected by the upper course of the Magdalena, and embraced between the two chief chains of the Cordillera; area, 18,000 sq. miles. It produces cacao, sugar, corn, and tobacco, and is rich in gold and silver. The volcano of Tolima has a height of 17,660 feet. Pop. 306,000. Capital, Ibague.

TOLL, a tax paid, or duty imposed, for some liberty or privilege or other reasonable consideration; such as (a) the payment claimed by the owners of a port for goods landed or shipped there; (b) the sum charged by the owners of a market or fair for goods brought to be sold there; (c) a fixed charge made by those intrusted with the maintenance of roads, streets, bridges, etc., for the passage of persons, goods, and cattle. See Roads.

TOLSTOI, Count Leo Nikolaievitch, celebrated Russian novelist, born in 1828. In 1851 he accompanied his brother to the Caucasus and entered the army, and during the Crimean war took part in the defense of Sebastopol. At the close of the war he retired to his estates and devoted himself to literary composition and schemes for the education and social improvement of the peasantry. Latterly he has entirely given himself up to working out the higher problems of life experimentally—working along with the peasantry in a sort of communistic life. Among his earliest writings of moment are his vivid sketches from Sebastopol. His three great novels are the Cossacks, War and Peace, and Anna Karenina. His later writings are all mostly directed toward an explanation of his peculiar social and mystic religious ideas. Among them are Confessions, My Religion, The Search for Happiness, Two Generations, Infancy and Youth, Death, Great Problems of History, What is My Life? The Kreutzer Sonata, etc.

TOLTEKS. See Mexico.

TOMAHAWK, the light battle-axe of

the North American Indians. The head was originally of stone attached to the shaft by thongs, etc., but steel heads were latterly supplied by American and



Tomahawks of the North American Indians.

European traders. The Indians can throw the tomahawk to a considerable distance, unerringly striking the object aimed at with the edge of the hatchet.

TOMA'TO, or **LOVE-APPLE**, a plant belonging to the natural order Solanaceæ. It is a native of South America, but has been introduced into most other warm or temperate countries. It is cultivated



Tomato.

for the sake of its fruit, which is fleshy, usually scarlet or orange, irregularly shaped, and is largely used in sauces, stews, and soups, as well as eaten by itself. The plant is a tender, herbaceous annual, with yellow flowers.

TOMB, any sepulchral structure, usually a chamber or vault formed wholly or partly in the earth, with walls and a roof, for the reception of the dead. See Sarcophagus, Burial, and Funeral Rites.

TOMSK, a town of Western Siberia, capital of the government of Tomsk, on the right bank of the Tom, on the great road to China. Pop. 52,430.—The government of Tomsk has an area of 329,040 sq. miles, and a pop. of 1,929,092. It is watered by the Obi and its tributaries, and is wild and desolate in the north, but furnishes excellent pasture in the south.

TON, a denomination of weight equivalent to 20 hundredweights (contracted cwt.), or 2240 lbs. In America goods are sometimes weighed by the short ton, of 2000 lbs., the hundredweight being reckoned at 100 lbs.; but it is decided by act of congress that, unless otherwise specified, a ton weight is to be understood as 2240 lbs. avoirdupois.

TONE, in music, the sound produced by the vibration of a string or other sonorous body; a musical sound. Nearly every musical sound is composite, that is consists of several simultaneous tones having different rates of vibration according to fixed laws, which depend on the nature of the sonorous body and the mode of producing its vibrations. The simultaneously sounding components are called partial tones; that one having

the lowest rate of vibration and the loudest sound is termed the prime, principal, or fundamental tone; the other partial tones are called harmonics or overtones. See Music, Gregorian Tones, Harmonics, Acoustics.

TONGUE, the organ found in the mouth of most vertebrate animals, which exercises the sense of taste, and also assists in speech and in taking food. The name tongue is also given to very different structures in Invertebrata. In man the tongue is attached by its base or root to the hyoid bone; its other extremity being free. The upper surface is convex with a fibrous middle septum, called the raphé. The front two-thirds of the tongue are rough, and bear the papillæ, in which the sense of taste resides. The posterior third is smooth, and exhibits the openings of numerous mucous glands. The substance of the tongue consists of numerous muscles. The papillæ, which cause the characteristic roughness of the tongue, are of three kinds, circumvallate, fungiform, and filiform. The largest or circumvallate papillæ number from eight to ten, and occupy the posterior part of the upper surface. They vary from $\frac{1}{16}$ th to $\frac{1}{8}$ th inch in diameter. The fungiform papillæ are scattered irregularly, the filiform over the front. In structure the papillæ are like those of the skin (which see), and contain capillary vessels and nervous filaments. Numerous follicles and mucous or lingual glands exist on the tongue, the functions of these latter being the secretion of mucus. The nervous supply is distributed in the form of three main nerves to each half of the organ. The gustatory nerves and the glossopharyngeal branches are the nerves providing the tongue with common sensation, and also with the sense of taste; while the hypoglossal nerve invests the muscles of the tongue with the necessary stimulus. The conditions necessary for the exercise of the sense of taste are, firstly, the solution of the matters to be tasted; secondly, the presence of a special gustatory nerve; and thirdly, that the surface of the tongue itself be moist. The top and edges of the tongue are more sensitive to taste than the middle portion. The sense of touch is very acute in the tongue.

TONIC, or **KEY-NOTE**, in music, the first or fundamental note of any scale, the principal sound on which all regular melodies depend, and in which they or their accompanying basses naturally terminate.

TONIC, in medicine, any remedy which improves the tone or vigor of the fibers of the stomach and bowels, or of the muscular fibers generally. Tonics may be said to be of two kinds, medical and non-medical. Medical tonics act chiefly in two ways: (1) indirectly, by first influencing the stomach and increasing its digestive powers; such being the effect of the vegetable bitters, the most important of which are calumba, chamomile, cinchona bark, gentian, taraxacum, etc. (2) Directly, by passing into and exerting their influence through the blood; such being the case with the various preparations of iron, certain mineral acids, and salts. The non-medical tonics are open-air exercise,

friction, cold in its various forms and applications, as the shower-bath, sea-bathing, etc.

TONKA (or Tonga) **BEAN**, the fruit of a shrubby plant of Guiana. The fruit is an oblong dry fibrous drupe, contain-



Tonka-bean plant.

ing a single seed. The odor of the kernel is extremely agreeable. It is used in perfumery. Called also Tonkin-bean, Tonquin-bean.

TONNAGE, a word originally signifying the number of tons weight which a ship might carry with safety, but now used to denote the gauge of the vessel's dimensions, and the standard for tolls, dues, etc. It is generally assumed that 40 cubic feet shall constitute a ton, and the tonnage of a ship is considered to be the multiple of this ton which most closely corresponds with the internal capacity of the vessel. Formerly the rule was to multiply the length of the ship by the breadth, assume the depth to be the same as the width, multiply by this assumed depth, and divide the product by 94, the quotient being the tons burden. But this mode was found to be both misleading and dangerous; for as harbor and light dues, towage, etc. were charged according to tonnage, shipowners had their vessels built so deep and narrow that they were often unseaworthy. An improved system was introduced in 1835 and made compulsory by the British Merchant Shipping Act of 1854. The elaborate instructions of this statute take into account not only the depth of the vessel, but also make allowance for the varying curvature of the hull. The depth from the deck to the bottom of the hold is taken at different places, and the breadth is measured at different elevations in the depth. If the vessel is a steamer an allowance is made for the space occupied by the engine-room, boilers, coal-bunks, etc. In vessels with a break or poop in the upper deck, the tonnage of this poop space must be ascertained and added to the ordinary tonnage. In the United States the measurement is similar.

TONQUIN (tong-king'), the most northern province of Anam in Asia; area, 35,000 sq. miles. The chief river is the Song-ka. The principal agricultural products are rice, cotton, spices, and sugar; and the province is rich in timber and minerals. The climate is unhealthy. By treaty dated June, 1884, Tonquin was ceded to France. Pop. 9,000,000.

TONSILLITIS, See Quinsy.

TONSILS, in anatomy, two oblong suboval bodies situated on each side of the throat or fauces. Their minute structure resembles that of the closed sacs or follicles of Peyer in the intestine, and their function is not yet understood. See Palate.

TONSURE, the name given to the bare place on the heads of the Roman Catholic and Greek priests, formed by shaving or cutting away the hair and keeping it so. The custom of cutting away the hair in token of the dedication of a person to the service of God is mentioned as early as the 4th century. Shaving the hair precedes consecration; it is performed by the bishop. The tonsure admits the subject into holy orders, and the extent of the tonsure increases with the rank held.

TONTINE, a kind of life annuity, so called from their inventor Tonti, an Italian of the 17th century. A tontine is an annuity shared by subscribers to a loan, with the benefit of survivorship, the annuity being increased as the subscribers die, until at last the whole goes to the last survivor, or to the last two or three, according to the terms on which the money is advanced. By means of tontines many government loans were formerly raised in England.

TOOMBS, Robert, American statesman, was born at Washington, Ga., in 1810. After several years in the Georgia legislature he was elected to congress in 1844 and held his seat for four terms until 1853, when he was elected to the United States senate, and in 1859 reelected. It was chiefly his influence, in opposition to the more conservative views of his life-long friend, Alexander H. Stephens, that led Georgia to pass its ordinance of secession. On the election of Davis, Toombs accepted the office of secretary of state, but resigned after a short time and accepted a commission as brigadier-general. He served in the second battle of Bull Run and at Sharpsburg, and later was made brigadier-general of the Georgia militia. He was a bitter opponent of the "Reconstruction" measures, and never took the oath of allegiance. He is mainly remembered as one of the most typical and vigorous of the so-called Southern "fire-eaters." He died in 1885.

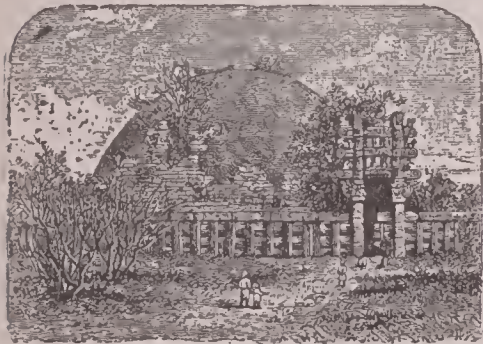
TOOTH. See Teeth.

TOOTHACHE, a well-known affection of the teeth, arising from various causes. Inflammation of the fangs of the teeth is a common cause. If the inflammation is not reduced matter forms, and the result is a gum-boil. Caries is a frequent cause of toothache, the outer part of the tooth rotting away and exposing the nerve. Neuralgia toothache is a purely nervous variety and may occur either in sound or carious teeth. As a preventive against toothache the teeth should be kept scrupulously clean, and when they show symptoms of decay the services of a skilful dentist should be had recourse to. The decay of a tooth is very often arrested by stopping or filling up the cavity.

TOPAZ, a mineral, ranked by mineralogists among gems, characterized by having the luster vitreous, transparent to translucent; the color yellow, white,

green, blue; fracture subconchoidal, uneven; specific gravity, 3.499. It is harder than quartz. It is a silicate of aluminium, in which the oxygen is partly replaced by fluorine. It occurs massive and in crystals. The primary form of its crystal is a right rhombic prism. Topazes occur generally in igneous and metamorphic rocks, and in many parts of the world, as Cornwall, Scotland, Saxony, Siberia, Brazil, etc. The finest varieties are obtained from Brazil and the Ural mountains. Those from Brazil have deep yellow tints; those from Siberia have a bluish tinge; the Saxon topazes are of a pale wine-yellow, and those found in the Scotch Highlands are of a sky-blue color. The purest from Brazil, when cut in facets, closely resemble the diamond in luster and brilliance.

TOPE, a popular name for a species of Buddhist monument intended usually to mark some important event. The oldest monuments of this kind are



Great tope at Sanchi, Central India.

spherical or elliptical cupolas, resting on a circular or rectilinear base, with an umbrella-shaped structure on the apex.

TOPEKA, the capital of Shawnee county and of the state of Kansas, on the Kansas river, 68 miles west of Kansas City and on the Santa Fe, Rock Island, Union Pacific and Missouri Pacific railroads. It has wide well-built



State capitol, Topeka, Kan.

streets, and contains a handsome state-house, court-house, several high-class educational institutions, etc. There are flour-mills, iron-foundries, a rolling-mill, machine-shops, brick-kilns, breweries, etc. Bituminous coal is found in the neighborhood. Pop. 51,600.

TOPHET. See Gehenna.

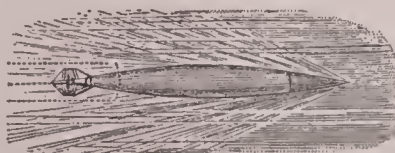
TORNA'DO, a violent cyclonic storm; more especially applied to those whirlwind hurricanes prevalent in the West Indies, and on the west coast of Africa about the time of the equinoxes, and in

the Indian ocean about the changes of the monsoons. Tornadoes are usually accompanied with severe thunder, lightning, and torrents of rain; but they are of short duration and limited in area.

TORON'TO, one of the chief cities of the Dominion of Canada, capital of the province of Ontario, situated in the county of York, on a small bay on the northwest coast of Lake Ontario, 315 miles w.s.w. of Montreal. Toronto has iron-foundries and engineering works, agricultural implement works, breweries, carriage-works, tanneries, soap works, boot and shoe factories, piano and organ factories, stove foundries, etc. It was founded in 1794 and was originally named York. Pop. 325,400.

TORPE'DO, the name of fishes allied to the rays, noted for their power of giving electrical shocks by means of specially-developed electrical organs. The electrical organs consist of two masses placed on each side of the head, and composed of numerous vertical gelatinous columns separated by membranous septa, and richly furnished with nervous filaments. The production of electricity by these fishes is readily enough explicable on the ground of the conversion of an equivalent of nerve force into electric force by the electric organ; just as, under other circumstances, nerve force is converted into motion through the muscles. The power of the discharge varies with the health and size of the fish. The torpedoes occur in typical perfection chiefly in the Mediterranean sea, and in the Indian and Pacific oceans. A large specimen may measure 4 feet long, and weigh from 60 to 70 pounds.

TORPEDO, a name for two distinct classes of submarine destructive agents, namely, torpedoes proper, which are movable, and are propelled against an enemy's ship; and submarine mines, which lie stationary in the water. Of the first class, called offensive torpedoes, there are three principal types: (a) the "locomotive," of which the Whitehead is the best-known form; (b) the "towing" torpedo of Captain Harvey; and (c) the "spar" or "outrigger" torpedo. The Whitehead, or fish torpedo, may be described as being a eel-shaped vessel, varying from 14 to 19 feet in length, and from 14 to 16 inches in diameter. It is made of specially prepared steel, and is divided into three compartments; the head contains the gun-cotton which forms its charge and the fuse for exploding it when it comes in contact with a vessel. The central part contains the engines by which it is propelled, and which are



Whitehead torpedo.

worked by compressed air, a sufficient supply of which for driving the torpedo the required distance is stored in the third, or tail compartment. The propeller is a three-bladed screw, which

can move the largest sized torpedoes at a speed of 24 knots for the distance of 220 yards, the distance of 1000 yards being reached at a slower rate of progress. By means of a horizontal balance rudder it can be made to sink and to remain during its run at any required distance below the surface of the water, so that it may be discharged from the deck of a ship or from a tube opening into the sea below the water-line. At close quarters this is a very destructive weapon against iron-clad vessels, striking them beneath their armor. The Harvey torpedo is constructed to be pulled through the water something in the fashion of a ship's log. It has been, however, superseded by the Brennan and other forms of manœuvred torpedo. The spar or outrigger torpedo consists simply of a metal case containing the explosive substance (gunpowder, gun-cotton, dynamite, etc.), and fitted with a fuse constructed so that it can be fired at pleasure, or exploded by contact with a ship's side. It is screwed on to a long spar, which is usually fixed in the bow of a swift boat or steam-launch, which endeavors to reach and push the torpedo against the hostile vessel. Stationary torpedoes or submarine mines, such as one placed in channels or coasts to prevent the approach of the enemy's vessels, usually consist of a strong metal case containing an effective explosive, such as gun-cotton, etc., and having a fuse or cap which will explode the charge on the slightest contact; or the explosion may be effected by means of electricity, the operator firing it at will from the shore.

TORPEDO-BOAT, a vessel specially intended to make use of torpedoes in warfare by exploding them against another vessel. The torpedo-boat is usually a small, swift steamer, lying low in the water, and meant to approach the enemy either by surprise or under cover of darkness. Such vessels are chiefly intended for the protection of coasts against hostile vessels. They vary greatly in size, the smaller being only of from 12 to 15 tons. Some of them have a speed of 27 knots or more. Another class of torpedo craft are the torpedo-boat destroyers, or "torpedo-catchers," very fast vessels, heavily armed with quick-firing guns, and with good sea-going qualities. See Submarine Boat.

TORRICELLI (tor-ri-chel'lē), Evangelista, Italian physicist, born in 1608, died in 1647. Torricelli's name is important in the history of science as the discoverer of the law on which the barometer depends. See Barometer.

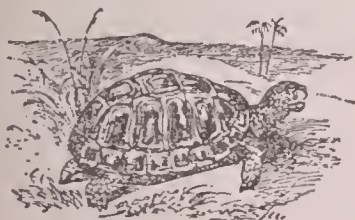
TORSION BALANCE, an instrument employed to measure the intensities of very small forces. It consists of a fine wire, silk thread, or the like, suspended from a fixed point, and having a horizontal needle attached, the force being measured by the resistance to twisting which the filament exhibits when the force (that of attraction, for instance) acts on the needle.

TORSO, an art term signifying the trunk of a statue of which the head and the extremities are wanting. The torso of Hercules, in the Belvidere at Rome,

is considered by connoisseurs one of the finest works of art remaining from antiquity.

TORT, in law, denotes injustice or injury. Actions upon torts or wrongs are all personal actions for trespasses, nuisances, assaults, defamatory words, and the like.

TORTOISE (tor'tis), the name applied to various genera of reptiles included with the turtles and their allies. The distinctive features of the tortoises consist in the modification of the skeleton and of the skin-structure or scales to form the well-known bony box in which their bodies are inclosed, the upper portion of which is the carapace, the lower the plastron. The land-tortoises have short stunted limbs adapted for terrestrial progression; the short toes are bound together by the skin, and have well-developed nails. The carapace is strongly convex, and is covered by horny epidermic plates. The horny jaws are adapted for cutting, or may be divided into serrated processes. The head, limbs, and tail can be completely retracted within the carapace. Though capable of swimming, the tortoises proper are really terrestrial animals, and are strictly vegetable feeders. The most familiar example is the common Greek or European tortoise which occurs chiefly on the eastern borders of the Mediterranean. These animals sometimes live to a great age (over 100 years according to some), and hibernate through the colder season of



Common or Greek tortoise.

the year. They attain a length of 12 inches. A much larger species is the great Indian tortoise, which attains a length of over 3 feet and a weight of 200 lbs. Its flesh is reckoned food of excellent quality, as are also its eggs. The box tortoise of India and Madagascar is remarkable for the curious development of the front part of the plastron, which shuts over the anterior aperture of the shell like a lid when the animal retracts itself. In the box tortoise of North America the hinder part of the plastron forms a lid. It is included among the Emydæ or terrapins. Other genera include the alligator terrapin of America, also called the "snapping turtle." The mud of soft tortoises occur in Asia, Africa, and North America. They have soft fleshy lips, and no horny plates are developed in the skin. Very frequently also the ribs are not so modified as to form a hard carapace, as in other chelonia. See also Turtle.

TORTOISE-SHELL, a name popularly applied to the shell or rather the scutes or scales of the tortoise and other allied chelonians, especially to those of the hawk's-bill turtle, a species which inhabits tropical seas. The horny scales or plates which form the covering of this

animal are extensively used in the manufacture of combs, snuff-boxes, etc., and in inlaying and other ornamental work. It becomes very plastic when heated, and when cold retains with sharpness any form it may be molded to in its heated state. Pieces can also be welded together under the pressure of hot irons. It is now largely imitated by horn and cheap artificial compounds.

TORTU'GAS, or **DRY TORTUGAS**, a group of ten small low barren islands belonging to Florida, United States, about 40 miles w. of the most western of the Florida Keys. On Loggerhead Key there is a lighthouse 150 feet high.

TORTURE, the arbitrary and especially excessive infliction of pain judicially, whether to extort confession or to aggravate punishment. Torture has been common in all the nations of modern Europe, and it was also practiced by the ancient Romans. The practice was first adopted by the church in the early middle ages, and when the old superstitious means of discovering guilt (as in ordeal by fire and water) lost their efficacy torture became general in Europe. Though never recognized by the common law of England, it was employed there as late as the reign of Charles I., and in Scotland torture was not wholly abandoned till very near the close of the 17th century. Every reader is familiar with the horrid tortures inflicted on those accused of witchcraft, and on many of the covenanters, by means of thumbkins, the boot, etc., in order to discover alleged hiding-places and the like. In the German states torture continued to be practiced under certain restrictions till the close of the 18th century. The chief instrument of torture was the rack (which see).

TOTEM, a rude picture of some natural object, as of a bird or beast, used by the American Indians as a symbol and designation of a family or tribe.



Totem posts.

A similar practice has been found to prevail among other savage peoples, and some theorists have given it a very wide extension on purely conjectural grounds.

TOUCAN, a genus of scansorial or climbing birds. These birds inhabit the

tropical regions of South America and are distinguished by a large keeled bill. The bill is about 8 inches long, and its substance is hallowed out into air-cells, thus being comparatively light. The



Red-billed toucan.

toucans feed on fruits, seeds, insects, etc. The prevailing colors among the toucans are yellow, black, and red. The bill is frequently very brilliantly colored.

TOUCH, the sense of feeling and the most widely diffused of the senses. It resides in the skin (see Skin), and is exercised through certain structures situated in the papillæ of the true skin and connected with terminal filaments of sensory nerves. These structures have some variety of form, and are called tactile cells, tactile corpuscles, compound tactile corpuscles, Pacinian corpuscles, etc. All the kinds are to be regarded as terminal organs of the sensory nerves, acting as the media by which impressions made on the skin are communicated to the nerve fibers. Although the sense of touch is diffused over the whole body, it is much more exquisite in some parts than in others. Experiment shows the tip of the tongue to be the most sensitive surface, the points of the fingers come next, while the red part of the lips follows in order. The neck, middle of the back, and the middle of the arm and thigh are the least acute surfaces.

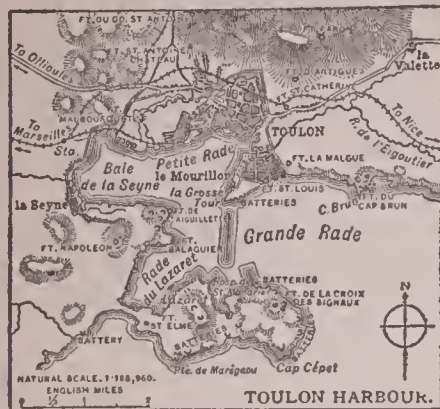
TOUCH-PAPER, paper steeped in saltpeter, which burns slowly, and is used as a match for firing gunpowder, etc.

TOUCHSTONE, a variety of extremely compact siliceous schist, used for ascertaining the purity of gold and silver. Known also as black jasper and basanite. It was called Lydian stone, or lapis Lydia, by the ancients, because found in Lydia in Asia Minor. A series of needles (called touch-needles) of which the composition is known are used for comparison with the article to be tested. When the color of the streak produced by both the needle and the trinket on the stone is the same the quantity of alloy they contain is supposed to be similar.

TOULON-SUR-MER (tō-lōn-sūr-mâr), a seaport, and after Brest the most important naval station of France, in the department of the Var, situated on a bay of the Mediterranean, 42 miles e.s.e. of Marseilles. It is defended by numerous forts and redoubts, and strong forts and outworks occupy all the heights surrounding the town. Toulon has a cathedral originally Romanesque of the 11th century, a good town-hall, theater, etc., besides the arsenal and other marine establishments, which are

TOULOUSE

on a most extensive scale. The chief harbors and docks are separated from the roadstead by moles, which are hollow and bomb-proof, and lined by bat-



teries, and the storehouses, ship-yards, workshops, etc., are most complete. Pop. 101,172.

TOULOUSE (tô-lôz), a town of Southern France, capital of the department of Haute-Garonne, on the Garonne (which is navigable and crossed by three bridges), 160 miles s.e. of Bordeaux. Among remarkable public buildings are the cathedral, the church of St. Sernin, the Hotel de Ville, and the Palais de Justice. Toulouse has university faculties, a Roman Catholic university, a lyceum, and other educational institutions, public library of 60,000 vols., etc. It is the chief entrepôt of the district for agricultural produce and general trade, and is an important industrial center. Pop. 149,791

TOURAC'O, a name of insessorial birds, natives of Africa, and allied to the Scansores, or climbing birds. Their pre-



Touraco.

vailing color is green, varied in some species with purple on the wings and tail. They feed chiefly on soft fruits.

TOURAINÉ (tô-rân), an ancient province of France, bounded north by Maine, east by Orléanais and Berry, south by Berry and Poitou, and west by Anjou and Poitou. It now forms the department of Indre-et-Loire.

TOURCOING (tör-kwan), a town of France, department of Nord, 9 miles n.n.e. of Lille, a well-built thriving manufacturing town, the staple manufactures being woolen, cotton, linen, and silk stuffs, besides dye-works, soap-works, sugar-refineries, machine works, etc. Pop. 78,468.

TOURGUENIEFF (tör-gen'yef), Ivan Sergeyevitch, a celebrated Russian novelist, born at Orel 1818, died near Paris.

1883. His first important publication was translated into English under the title of *Russian Life in the Interior, or the Experiences of a Sportsman*. A powerful politico-social novel, *Fathers and Sons*, was published in 1861, and met with much adverse criticism in Russia. His other works include *Smoke*, *Spring Floods*, *Virgin Soil*, etc., all of which have been translated into English. Tourguenieff has been ranked with the greatest masters of fiction.

TOURMALINE (tör'ma-lin), a mineral occurring crystallized in three-sided or six-sided prisms, terminated by three-sided pyramids, the primary form being a rhomboid. It scratches glass easily, has a specific gravity of 3, and consists principally of a compound silicate and borate of alumina and magnesia. Tourmaline occurs most commonly in igneous and metamorphic rocks, especially in granite, gneiss, and mica-slate. Some varieties are transparent, some translucent, some opaque. Some are colorless, and others green, brown, red, blue, and black. Red tourmaline is known as rubellite, blue tourmaline as indicolite, and black tourmaline as schorl. The transparent varieties include various well-known jewelry stones, as the Brazilian sapphire, the Brazilian emerald, etc. Prisms of tourmaline are much used in polarizing apparatus, and it possesses powerful electric properties.

TOURNAMENT, or TOURNEY, a common sport of the middle ages, in which parties of mounted knights encountered each other with lances and swords in order to display their skill in arms. Tournaments reached their full perfection in France in the 9th and 10th centuries, where they first received the form under which they are known to us. They were introduced into England soon after the conquest of the Normans. Jousts were single combats between two knights, and at a tournament there would often be a number of jousts as well as combats between parties of knights. The place of combat was the lists, a large open place surrounded by ropes or a railing. Galleries were erected for the spectators, among whom were seated the ladies, the supreme judges of tournaments. A knight taking part in a tournament generally carried some device emblematic of a lady's favor. Tournaments gradually went out with the decline of chivalry, and were little practiced after the 16th century.

TOURNIQUET, an appliance employed in the practice of surgery to stop bleeding, its use being only intended to be temporary. Some kinds of ligature twisted tight with a stick forms a simple tourniquet.

TOURS (tör), a town of France, capital of the department of Indre-et-Loire, on the left bank of the Loire, 145 miles by rail southwest of Paris. The principal edifice is the cathedral (Tours being an archbishopric), flanked by two towers, 205 feet high, a fine building begun in the 12th, completed in the 16th century. It became famous for its silk manufactures, and had a population of 80,000, when the revocation of the edict of Nantes deprived it of nearly half its inhabitants, a blow from which it has never recovered. In 1870 Tours was the

seat of the government of national defense. Pop. 64,448.

TOURVILLE, De, Anne Hilarion de Colontin, Count, a distinguished French admiral, born at Tourville, La Manche, 1642; died at Paris 1701. He defeated a Dutch and English fleet off Beachy Head in July, 1690. In 1692 he was ordered to attack a far superior Dutch-English fleet off La Hogue, and was defeated. He was created a marshal in 1693, and in 1694 destroyed a Dutch and English trading fleet off Cape St. Vincent.

TOUSSAINT-LOUVERTURE (tō-saŋ-lō-ver-tür), a distinguished negro, born a slave in the Island of Hayti in 1743. After the insurrection of 1791 Toussaint served in the army of the blacks, and latterly rose to be their leader. After a severe struggle with insurrectionary movements he assumed supreme civil authority, and in 1801 was completely master of the island. Napoleon did not choose to see him independent, although professedly loyal to France, and sent a powerful expedition to subdue Toussaint, who was forced to surrender. After a vigorous resistance he was seized and sent to France, where he died in prison, 27th April, 1803.

TOWER OF LONDON, a celebrated ancient fortress in London, consisting of a collection of buildings of various ages on a somewhat elevated position on the north bank of the Thames, outside the old city walls. It covers about 13 acres, and is surrounded by a battlemented wall flanked with massive towers and encircled by a moat. There is also an inner line of circumvallation broken by towers, and interspersed with other buildings. In the center is the White Tower, the keep of the old fortress, around which are grouped the chapel, the jewel-house, barracks and



The Tower of London.

other buildings. The Tower was a first-class mediæval fortress, and served at once as a palace, a prison, and a place of defense. The White Tower was built by Gundulf, bishop of Rochester, for William I. in 1078. It was successively strengthened by various English sovereigns. The regalia, consisting of the royal crowns, sceptres, etc., are now kept and exhibited in the jewel-house. The armory contains a fine collection of armor and weapons. In the part called the Bloody Tower the two young princes, sons of Edward IV., were murdered. The Tower is now chiefly used as an arsenal, and has a small military garrison of the yeomen of the guard. It is governed by a constable and deputy-constable. The governorship is still a post of distinction.

TOWN. See City.

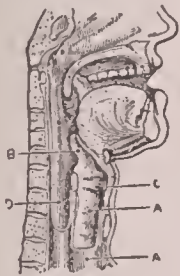
TOWNS'END, Edward Waterman, American novelist, was born in Cleveland, Ohio, in 1855. His novels of New York life with the picturesque slang of the streets have been very successful. Among them are: *Chimmie Fadden* and *Major Max*; *Chimmie Fadden Explains*, *Major Max Expounds*. A *Daughter of the Tenements* and *Days Like These* are novels, also of New York life. Later books are *Chiminie Fadden* and *Mr. Pard*, and *Lees and Leaven*.

TOWNSEND, George Alfred, American journalist, was born in Georgetown, Del., in 1841. He was successively connected with the *Philadelphia Inquirer* and *Press*, the *New York Herald* and *World*, and the *Chicago Tribune*. He first gained distinction as a war correspondent. Among his books the most noteworthy are: *Campaigns of a Non-Combatant*, *Poems*, *Washington Outside and Inside*, *Tales of the Chesapeake*, *The Entailed Hat*, and a drama, *President Cromwell*. Much of his newspaper correspondence was over the signature *Gath*.

TOWNSHIP, in England, a division of a parish which has a constable, and may have overseers of the poor belonging to itself. In the United States a township is a subdivision of a county, without reference to its population. They are generally squares of 36 sq. miles area.

TOXICOLOGY, the science of poisons and antidotes. See *Poison*.

TRACHEA (tră'kē-a), or **WINDPIPE**, in anatomy, the name given to the tube extending from the larynx (which see) down into the chest to a point opposite the third dorsal vertebra, where the tube divides into two chief divisions or bronchi (which see), one of which supplies each lung with the air necessary for respiration or breathing. The trachea in man is of cylindrical form, about $4\frac{1}{2}$ inches long, and from $\frac{3}{4}$ to 1 inch in diameter, and is composed of from sixteen to twenty rings or



Trachea—Section through part of face and neck.

zones of gristly or cartilaginous nature, separated and connected by fibrous tissue. Each cartilage forms an imperfect ring, being unclosed behind, and having the gristly edges merely joined by fibrous membrane. The windpipe is lined by delicate mucous membrane which is covered by epithelial cells provided with delicate vibratile processes or cilia. All mammals, reptilia and birds possess a trachea, but some amphibia want this organ; the lungs in such cases springing directly from the larynx. The cut shows the trachea a, the epiglottis b, the larynx c, and the œsophagus d.

TRACHEOTOMY, LARYNGOTOMY, or BRONCHOTOMY, an operation in which an opening is made into the trachea or larynx, as in cases of suffocation.

TRACING-PAPER, transparent paper which enables a drawing or print to be clearly seen through it when laid on the drawing, so that a pen or pencil may be used in tracing the outlines of the original. It is prepared from smooth unsized white paper rendered transparent by a varnish made of oil of turpentine with an equal part Canada balsam, nut-oil, or other oleo-resin.

TRACTION-ENGINE. See under *Steam-engine*.

TRADE, Boards of, are associations of merchants, bankers, brokers, and manufacturers, organized in the leading cities of the United States and Europe, to develop and promote the financial, commercial and productive interests of communities and nations; movements in behalf of associations of this character were started in America as early as 1768, when the Chamber of Commerce of New York City was established. The purpose of these local organizations is to consider questions of local importance connected with trade, commerce, transportation, etc., and to secure the establishment and promotion of undertakings of a local character. These local organizations may be divided into trading and deliberative bodies, the Merchants Exchange of St. Louis and Board of Trade of Chicago being of the former class, and the Chamber of Commerce of New York City of the latter. In 1868 a meeting of delegates from 30 of the largest cities met at Philadelphia, and perfected an organization "to promote the efficiency and extend the usefulness of the various Chambers of Commerce, Boards of Trade, and other chartered bodies, organized for commercial purposes in the United States, in order to secure unity and harmony of action in reference to commercial usages, customs, and laws; and especially in order to secure the proper consideration of questions pertaining to the financial, commercial, and industrial interests of the country at large." Since that date conventions have been held annually, with steadily increasing benefits to the cause the association was created to foster and encourage. Supplementary to boards of trade and chambers of commerce, organizations have been recently created for similar purposes in connection with some especial department of commercial endeavor, such as corn and produce exchanges, etc. These exert a substantial influence in their several fields of usefulness, and are steadily growing in number and importance.

TRADE-MARK, a peculiar mark used by a manufacturer to distinguish his own productions from those of other persons. Such marks can now be registered and protected in all the more important countries, and between these also there is a general reciprocity as to protection. Regarding trade-marks many nice questions may arise, and it is not easy to define what constitutes a valid trade-mark. A mere descriptive title or a geographical name will not

constitute a proper trade-mark; what it is best to select is some invented word or words, or a word or words having no reference to the character or quality (though suggestive of excellence), some distinctive device, figure, emblem, or design, or a written signature or copy of such. Any mark or name calculated to mislead as to the real nature or origin of the goods will be vitiated.

TRADES-UNIONS, a trade society is defined in the report of the Social Science committee on the subject appointed at Bradford, in 1859, "as a combination of workmen to enable each to secure the conditions most favorable for labor;" and although trades-unions, as they are generally called, almost always have other objects in view in addition to that specified in the definition, that object is their distinguishing one. Combinations of this sort in Great Britain are considerably more than three centuries old, for there is a statute of the year 1548 expressly directed against them. Trades-unions generally endeavor to regulate the prices and the hours of labor, and in many cases the number of men engaged by an employer, the number of apprentices which may be bound in proportion to the journeymen employed by a master, and the like. As accessories these unions may collect funds for benefit societies, and undertake the insurance of tools, libraries, and reading-rooms; but their fund, to which every member must regularly contribute a stated sum, is principally reserved for enabling the men to resist, by strikes and otherwise, such action on the part of the employers as would tend to lower the rate of wages or lengthen the hours of labor. That trades-unions enable the men to benefit by the state of trade more than they otherwise would have done would appear from the fact that the worst-paid trades are those without unions. Trades-unions are also said to have furthered the safety of the laborer by producing beneficial modifications of the conditions in which he works. Some hostility against trades-unions has been produced by the outrages of a more or less serious nature of which some of the unions, or members of them, have been guilty, such outrages being directed against the property of employers, or against the persons and tools of non-union men. The intimidation of non-unionists who venture to take work where the men are out on strike is also a common practice. In Britain special legislation has been introduced to cope with these outrages. The trades-unions now represented at the annual congress number considerably over one million. In the United States the federal statute providing for the incorporation of trades-unions, says: "In the meaning of this act shall signify any association of working people having two or more branches in the states or territories of the United States for the purpose of aiding its members to become more skilful and efficient workers, the promotion of their general intelligence, the elevation of their character, the regulation of their wages and their hours and conditions of labor, the protection of their individual rights in the prosecution of their trade or trades, the raising

of funds for the benefit of the sick, disabled, or unemployed members, or the families of deceased members, or for such other object or objects for which working people may lawfully combine, having in view their mutual protection or benefit." There is no record of a trade union before 1803, the year in which the New York Society of Journeymen Shipwrights was incorporated. In 1806 a union of the House Carpenters of the City of New York and of the Journeymen Tailors was organized. The New York Typographical Society had been in active existence for some time prior to 1817. In 1822 the Charitable Society of Shipwrights and Calkers of Boston and Charlestown was formed. During this period trade unionism was making progress. By 1840 local unions had been organized among the masons, marble-cutters, shoemakers, saddlers, hatters, tailors, printers, bricklayers, roofers, painters, carpenters, and shipworkers. In 1850 the International Typographical union was organized. The National Association of Hat Finishers of the United States of America was founded in 1854, the National Protective Association (the Locomotive Engineers) in 1855, the Sons of Vulcan and the National Spinners' association in 1858. Among the larger organizations may be named the National Labor union (1866), the Knights of Labor (1869), the International Association of Workingmen (1864), the Industrial Brotherhood (1873), the American Federation of Labor (1881), the National Building Trades Council (1897), and the American Labor Union (1898). By far the most important of these is the American Federation of Labor with a membership in 1907 of about 2,000,000.

TRADE-WIND, one of those perpetual or constant winds which occur in all open seas on both sides of the equator, and to the distance of about 30° north and south of it. On the north of the equator their direction is from the northeast (varying at times a point or two of the compass either way); on the south of the equator they proceed from the southeast. The origin of the trade-winds is this:—The great heat of the torrid zone rarefies and makes lighter the air of that region, and in consequence of this rarefaction the air rises and ascends into the higher regions of the atmosphere. To supply its place colder air from the northern and southern regions rushes towards the equator, which, also becoming rarefied, ascends in its turn. The heated air which thus ascends into the upper regions of the atmosphere being there condensed flows northward and southward to supply the deficiency caused by the under-currents blowing toward the equator. These under-currents coming from the north and south are, in consequence of the earth's rotation on its axis, deflected from their course as they approach the equatorial region, and thus become northeast and southeast winds, constituting the trade-winds. The belt between the two trade-winds is characterized by calms, frequently interrupted, however, by violent storms. Trade-winds are constant only over the open ocean, and the larger the expanse of

ocean over which they blow (as in the Pacific) the more steady they are. In some places the trade-winds become periodical, blowing one half of the year in one direction and the other half in the opposite direction. See Monsoon.

TRADITION, in its general application, is any knowledge handed down from one generation to another by oral communication. It plays a very important part in the Jewish and Roman Catholic churches. In theology, the term is specifically applied to that body of doctrine and discipline, or any article thereof, supposed to have been put forth by Christ or his apostles, and not committed to writing, but still held by many as an article of faith.

TRAG'ACANTH, a variety of gum familiarly termed gum-dragon or gum-tragacanth. It is the produce of several species of leguminous plants, natives of the mountainous regions of Western Asia. In commerce tragacanth occurs

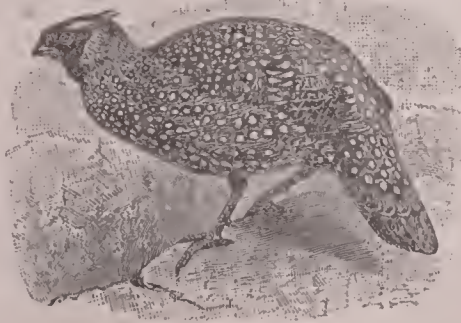


Tragacanth.

in small twisted thread-like pieces, or in flattened cakes, in color whitish or yellowish, devoid of taste or smell. It is demulcent, and is used in coughs and catarrhs, and to make lozenges and pills. It is employed also in calico-printing.

TRAGEDY, a dramatic poem, representing an important event or a series of events in the life of some person or persons, in which the diction is elevated and the catastrophe melancholy. Tragedy originated among the Greeks in the worship of the god Dionysus or Bacchus.

TRAG'OPAN, a name of certain beautiful birds of the genus *Cerionis*, and of the family Phasianidae, closely allied to



Crimson tragopan.

the common fowl. The most common species, is a native of the Himalayas. The plumage is spotted, and two fleshy protuberances hang from behind the eyes. When the bird is excited it can

erect these protuberances until they look like a pair of horns. A large wattle hangs at either side of the lower mandible.

TRAIN, George Francis, American author, was born in Boston, Mass., in 1829. His publications include: *An American Merchant in Europe, Asia and Australia*; *Young America Abroad*, *Irish Independency*, and *Championship of Women*. He also published an autobiography entitled *My Life in Many States and in Foreign Lands*. He died in 1904.

TRAINING COLLEGES. See Normal Schools.

TRAJAN, in full, Marcus Ulpius Trajanus, Roman emperor, born in Spain 52 A.D., was the son of Trajanus, a distinguished Roman commander under Vespasian. He served against the Parthians and on the Rhine, where he acquired so high a character that Nerva adopted him and created him Cæsar in 97. Nerva died in 98, and Trajan, who was then in Germany, peaceably succeeded to the throne. He made peace with the German tribes, and proceeded to introduce enlightened measures of reform into the public service. One of his greatest military achievements was his defeat of the Dacians, and the reduction of Dacia to a Roman province. It is supposed that it was in commemoration of this war that he erected at Rome the column which still remains under his name. In 103 he wrote the famous epistle to Pliny, governor of Pontus and



Trajan.

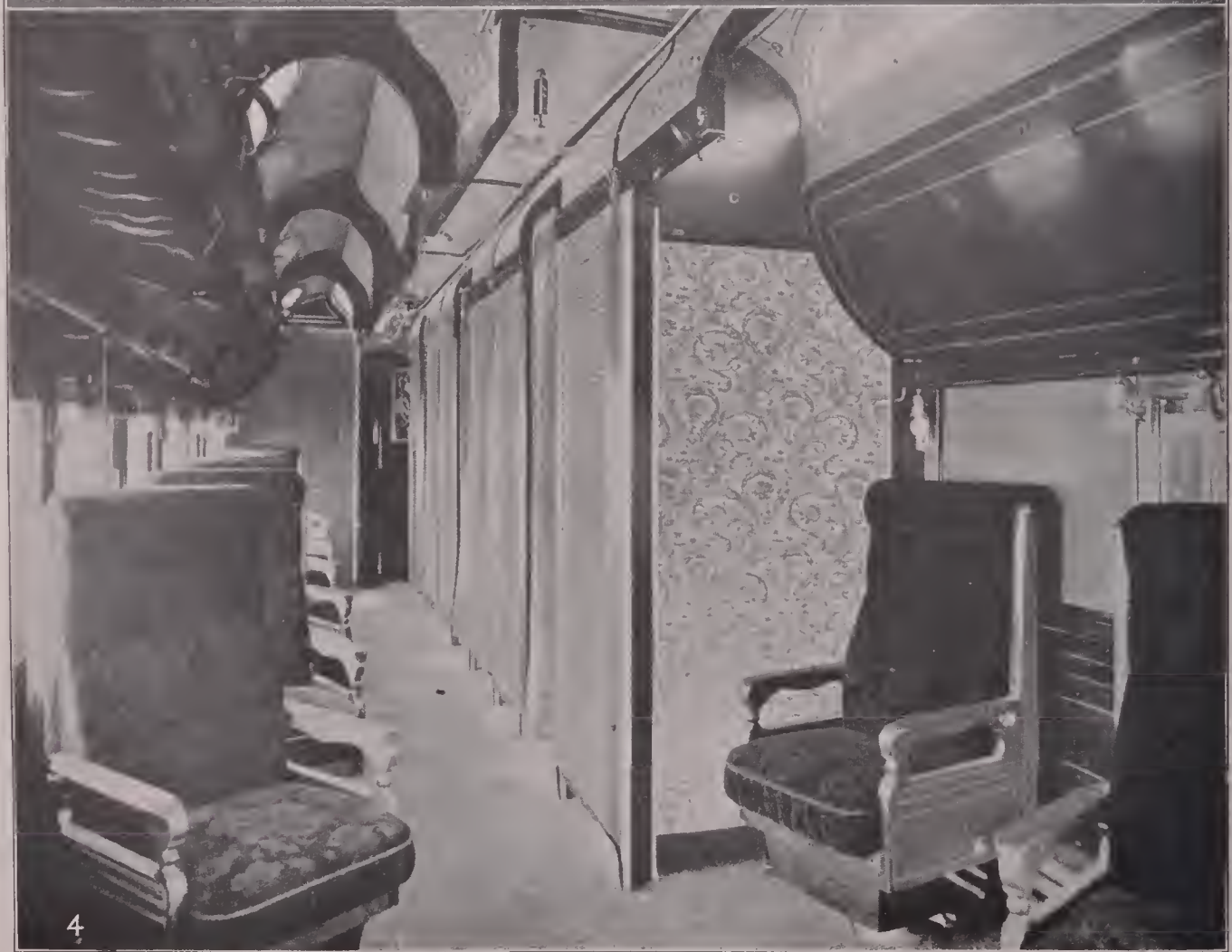
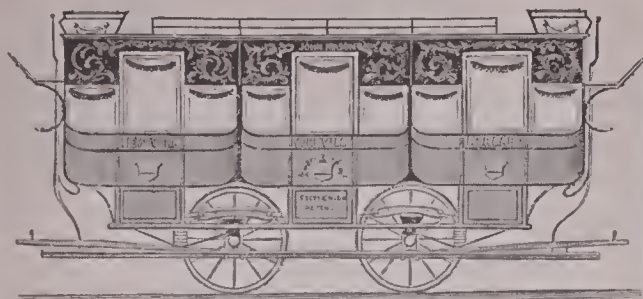
Bithynia, directing him not to search for Christians, but to punish them if brought before him; and on no account to listen to anonymous charges. For some years Trajan occupied himself with the work of administration, but in 114 he set out on an expedition against the Parthians which resulted in the reduction of Armenia to a Roman province. He died in Cilicia in 117 A.D., after having nominated Hadrian as his successor.

TRAMMEL, an instrument for drawing ovals, used by joiners and other



Trammel.

artificers. One part consists of a cross with two grooves at right angles; the



THE EVOLUTION OF THE STREET CAR

1. The "John Mason" original Street Car
2. A "Bobtail" Car still in use in 1902, at Decatur, Alabama
3. Exterior of first American Trolley Sleeping Car
4. Interior view of first American Trolley Sleeping Car

other is a beam-compass carrying two pins which slide in those grooves, and also the describing pencil.

TRAMWAYS, a kind of street railway introduced within recent times into many of the chief cities of the world. The commonest kind of street tramway is that in which grooved rails are used, the surface of which is nearly on a level with the street. Horse-power is one means used for propelling street cars, on other lines steam-engines are used for the purpose, while in some again the cars are drawn by underground cables. Latterly electricity has become exceedingly common as the means of propulsion, and has various advantages over other methods. Street tramways were first constructed at New York. The first in England were opened at Birkenhead in 1860, and they have since been introduced into nearly all the principal towns. The United States have over 20,000 miles of electric street railways, the most striking increase in recent years being in interurban railways, many of which have invaded the steam railroad field and are now operating sleeping, parlor and freight cars.

TRANCE, a condition resembling sleep, in which consciousness and many of the vital functions are suspended, and during which the action of the heart is diminished and the breathing reduced. The subjects of trance are usually hysterical, and in some cases it is induced by exhausting disease or emotional disturbance. In this condition the face is pale, the limbs relaxed, the mental functions are in abeyance, no effort at rousing will produce a return to consciousness, and this state may last from a period of several hours to many weeks or months. When the trance lasts for a lengthy period food is taken in a mechanical way at intervals by the sleeper. Most cases recover. The term is also applied to a sort of ecstatic state in which some persons are said to fall, and in which, while unconscious of what is passing around them, they have remarkable dreams or visions.

TRANSBAIKALIA, a Siberian province, e. of Lake Baikal; area, 240,780 sq. miles. It has an elevated, well-watered surface, and climate dry and extreme both in summer and winter. Agriculture and trade limited; gold found to some extent. Pop. 664,071.

TRANSCASPIAN REGION, a territory to the e. of the Caspian recently annexed by Russia. It has an area of 220,000 sq. miles, mostly uninhabited desert, and is traversed by the Transcaspiian railway, connecting Samarkand with the Caspian. Pop. 372,193.

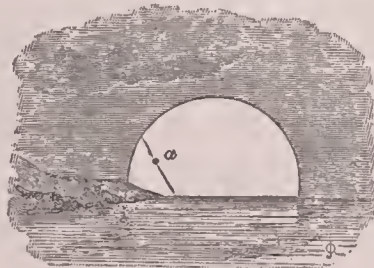
TRANSCENDENTAL, a term applied in the system of philosophy founded by Kant to all those principles of knowledge which are original and primary, and which are determined *a priori*, such as space and time. They involve necessary and strictly universal truths, and so transcend all truth derived from experience, which must always be contingent and particular. The term transcendentalism is now generally used in a sense not very different from mysticism, or for that which is vague and illusive in philosophy. In mathematics the term is applied to quantities that

cannot be expressed in ordinary algebraic terms.

TRANSEPT, in architecture, the transverse portion of a church which is built in the form of a cross; that part between the nave and choir which projects externally on each side, and forms the short arm of the cross in the general plan. See Cathedral.

TRANSFUSION, the transmission of blood from the veins of one living animal to those of another, or from those of a man or one of the lower animals into a man, with the view of restoring the vigor of exhausted subjects. This operation is a very old one, but seems to have generally ended in failure until about 1824, the chief cause of failure probably being the want of due precaution to exclude the air during the process. It is now occasionally resorted to as a last resource in cases of great loss of blood by hæmorrhage, especially in connection with labor.

TRANSIT, in astronomy, (a) the passage of a heavenly body across the meridian of any place, a phenomenon which is usually noted by a transit instrument. The determination of the exact times of the transits of the heavenly bodies across the meridian of the place of observation enables the astronomer to ascertain the differences of right ascensions, and the relative situations of the fixed stars, and the motions of the sun, planets, and comets, in respect of the celestial meridians. (b) The passage of one heavenly body



Transit of Mercury.
a, Mercury. The dotted line shows the path.

over the disc of a larger one; but the term is chiefly restricted to the passage of the inferior planets, Mercury and Venus, over the sun's disc. The transits of Venus are of great importance in astronomy, as they afford the best means of determining the sun's parallax, and consequently the dimensions of the planetary system. These transits are of rare occurrence, four taking place in 243 years, at intervals reckoning from the transit of 1874, in the order of 8, 122, 8, and 105 years, which gives the transit years 1882 (December 6), 2004, 2012, 2117. The transits of Mercury occur more frequently, but they are of far less astronomical interest, as they cannot be used for the same purpose, the planet being too distant from us.

TRANSIT INSTRUMENT, an important astronomical instrument adapted for observing the exact time of the passage of heavenly bodies across the meridian. (See Transit.) It consists essentially of a telescope fixed at right angles to a horizontal axis, which latter has its ends directed exactly to the east and west points of the horizon, so that

the line of collimation or optical axis of the telescope may move in the plane of the meridian. The instrument is susceptible of certain nice adjustments, so that the axis can be made perfectly horizontal, and at right angles to the plane of the meridian, in which plane the telescope must move. It is generally used in connection with the mural circle.

TRANSKEI, a general name given to a region of Southeast Africa north of the Kei river and southwest of Natal, and comprising several territories annexed at various times to the Cape Colony. These are grouped into the four divisions of Griqualand East, Tembuland, Transkei, and Pondoland. Pop. 560,000 natives, 10,000 whites.

TRANSMIGRATION OF THE SOUL, or **METEMPSYCHOSIS**, the passage which, according to the belief of many races and tribes at all times, the soul after the death of the body makes through the bodies of the lower animals or other human bodies, or, it may be, through plants or inanimate objects. In the teaching of the Brahmanic Hindus it has its foundation in the belief of the connection of all living beings, and of the gradual purification of the spiritual part of man and its return to the common source and origin of all things—God. The Buddhists accept a similar doctrine, but with them the ultimate goal of the soul is not absorption by the Deity, but annihilation, Nirvana. Transmigration also formed part of the teaching of the Egyptian priests. The doctrine probably passed from Egypt into Greece, where it was never generally current, but was confined to the mysteries and some philosophic systems. It occupied an important place in the system of Pythagoras, and is supported by Plato and Plotinus. Among the Romans Cicero alludes to this doctrine, and Caesar informs us that it was believed in by the Gauls, who, he says, in this faith were able to despise death. The doctrine is also found in the Talmud but only a minority of the Jewish rabbis appear to have adopted it. Various heretical Christian sects have held this doctrine, and it was also professed by the Arabs before Mohammed.

TRANSPORT, a ship employed by government for carrying soldiers, warlike stores, or provisions from one place to another.

TRANSUBSTANTIATION. See Lord's Supper.

TRANSVAAL, a British territory in South Africa, originally colonized by part of the Boers who left Cape Colony in 1836 for Natal, and quitted that colony on its annexation by Britain in 1845. It lies north of the Vaal river and south of the Limpopo, and is bounded by Rhodesia, Bechuanaland, Orange River Colony, Natal, Zululand, and Portuguese East Africa. Area, about 120,000 sq. miles; pop. 1,250,000. Pretoria is the seat of government; the largest town is Johannesburg. The country is elevated, forming high plateaux, and in some parts is quite rugged, mountains rising in the east to 8700 feet. In the south is the famous elevated tracks known as the Witwatersrand. The rivers are chiefly tributaries of the Limpopo. The climate is generally

salubrious. Minerals are abundant, especially gold, which is mined in many places, the chief being in the Witwatersrand, of which Johannesburg is the center. Coal is abundant, and is also worked. The country is more pastoral than agricultural. In 1877 the Transvaal was annexed by Britain, the country being far from flourishing, and a certain number of the people being in favor of this step. In 1880 the Boers took up arms against the British, defeated a body of troops at Majuba Hill, and as the result recovered their independence. By a convention made in 1884, the relation of the state to the British crown was modified, and from that date till 1900 it was known as the South African Republic. Latterly the area had been extended at the expense of the Zulus, and in 1894 Britain recognized Swaziland as a dependency of the Transvaal. A great increase of the population took place along with the extension of gold-mining, from about 1886, and various railways were constructed. For some years before 1895, much discontent prevailed among the "uitlanders" or aliens, whites not admitted to citizenship; and at the end of 1895 this led to an abortive revolution at Johannesburg. Simultaneously Dr. Jameson with an armed force belonging to the British South Africa Company, entered the Transvaal and rode toward Johannesburg, but was attacked and defeated by a body of Boers. In October, 1899, war broke out with Britain, the Transvaal being joined by the Orange Free State in commencing hostilities. After nearly eleven months' fighting and the occupation of the chief towns, the country was annexed by proclamation in 1900. Before the two Boer republics could be crushed Britain had placed some 200,000 men in the field under the supreme command of Lord Roberts. The president was then J. Paul Kruger, who had held the office continuously since 1883. The legislative power was exercised by two chambers, a first and a second Volksraad ("popular council"), each with twenty-four members. The former was in possession of all political power. The uitlanders had no voice in the government of the country though much of the taxation fell upon them. The annual output of gold is valued at about \$135,000,000. See Boers, Natal.

TRANSYLVANIA, a grand-principality belonging to the crown of Hungary forming the southeastern portion of the Austrian empire; area, 21,213 sq. miles. The surface is mountainous, the Carpathian chain covering its southern and eastern frontier, and sending out numerous ramifications into the interior. The chief rivers are the Aluta or Alt, the Maros, and the Szamos, all flowing directly or indirectly into the Danube. The forests are extensive and valuable; the vine flourishes everywhere, and the crops include corn, wheat, rye, hemp, flax, tobacco. The minerals are important, and include gold, silver, copper, lead, coal, salt, and iron. The chief towns are Hermannstadt, Kronstadt, Bistritz, and Szamos-Ujvar. Education is in a very backward state. The population (2,084,048) is very mixed, including Roumanians, Magyars, Germans, Gyp-

sies, Jews, Bulgarians, and others. The country now forms an integral portion of Hungary.

TRAP, a term rather loosely and vaguely applied by the earlier geologists to some or all of the multifarious igneous rocks that belong to the palæozoic and secondary epochs, as distinct from granite on the one hand, and the recent volcanic rocks on the other. Trap-rocks often assume a terraced appearance, whence their name from trappa, the Swedish for a stair. Their composition may be described as consisting chiefly of felspar and hornblende. Trap-rocks of crystalline structure are distinguished as greenstones, basalts, clinkstones, compact felspar, and felspar porphyries; while the softer and more earthy varieties are known as claystones, claystone porphyries, amygdaloids, trap-tuffs, and wackes. Basalt is the most compact, the hardest, and the heaviest of the trap-rocks. The hill scenery of trappean districts is often picturesque.

TRA'PANI, a fortified seaport town in Sicily, capital of the province of the same name, 47 miles w.s.w. of Palermo, on a peninsula shaped like a sickle, and hence its ancient name, from the Greek drepanē, a sickle. There is a good trade, and the fisheries are extensive. At a short distance e.n.e. of the town is Mount San Giuliano, the ancient Eryx. Pop. 60,257.

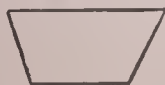
TRAP-DOOR SPIDER, a name given to certain spiders that have the habit of constructing tubular dwellings in the ground, sometimes a foot or more in depth, and an inch or so in diameter, closed by a sort of hinged door. They belong to several genera, and are found in Southern Europe, Western North America, and elsewhere. The dwelling



Trap-door spider and nest

is lined with the silky substance spun by the insect, and the hinge of the door is formed of the same, the door itself being constructed sometimes of earthy particles connected by threads, sometimes of leaves, etc. Some species construct nests that have a main tube and one or more branches, the latter having a door where they join the main tube.

TRAPEZOID, or **TRAPEZIUM**, a quadrilateral figure of unequal sides,



Trapezoid.

and consequently unequal angles. A trapezoid is usually said to have two

sides parallel, but some geometers define the trapezium as having this character.

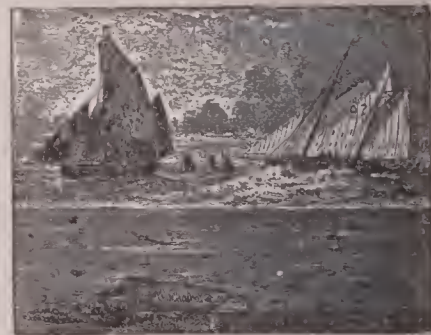
TRAPPE, La, Trappists. See La Trappe.

TRAVANCORE, a native Indian state, subsidiary to the presidency of Madras, occupying the extreme southwest of the peninsula; area, 6730 sq. miles. The principal agricultural products are rice, pepper, areca-nuts, cocoa, coffee, tobacco, and oil plants. Some sugar and salt are manufactured. Pop. 2,557,736.

TRAVELER'S TREE, an arborescent plant, native of Madagascar, having the appearance of a palm, and forming the only species of the genus to which it belongs. Its trunk terminates in a bundle of leaves, each of which is borne by a petiole often 10 feet in length, and has a blade about 6 feet long and 2½ to 3 feet broad. The seeds yield a flour, which is eaten by the natives, and the petioles a limpid and wholesome water, which often renders the tree a great resource for travelers; hence its name.

TRAVERSE CITY, the county-seat of Grand Traverse co., Mich., 60 miles northeast of Manistee; at the mouth of the Boardman river, on Grand Traverse bay, an inlet of Lake Michigan; and on the Pere Marquette, the Grand Rapids and Indiana, and the Manistee and Northeastern railroads. Pop. 11,216.

TRAWLING, a mode of fishing in which a net in the form of a large bag, with a strong framework keeping the mouth properly distended, is dragged along the bottom of the sea. It is the mode chiefly adopted in deep-sea fishing, but it is not allowed within three miles of the shore. Cod, whiting, and other white-fish are taken by it in large



Trawl-net attached to fishing-boat.

numbers, and some kinds of flat-fish, as soles, can scarcely be taken in any other way. Trawling can be practiced only on a smooth bottom, as a rough bottom would destroy the net. Trawling is sometimes objected to as destroying fish-spawn and immature fish, and so injuring the fishing-grounds. See Net.

TRAZ-OS-MONTES ("Beyond the Mountains"), a northeast frontier province of Portugal; area, 4260 sq. miles. The province is fertile in parts, and the wine-growing district of Alto Douro is the native country of port. The chief towns are Villa Real and Braganza. Pop. 396,676.

TREACLE. See Sugar.

TREAD-MILL, an instrument of punishment of modern origin, consisting of a large wheel, about 20 or 25 feet

TREASON

wide, with steps on its external surface, upon which criminals are placed. Their weight sets the wheel in motion, and they maintain themselves in an upright posture by means of a horizontal bar fixed above them, of which they keep hold. The power thus obtained may be applied to the same purpose as water-power, steam, etc. The tread-mill has recently been abandoned in most penitentiaries. It was introduced into the prisons of Great Britain about 1820.

TREASON, High, treason is that crime which is directly committed against the supreme authority of the state, and is considered to be the greatest crime that can be committed.

TREASURY, Department of the, the executive department controlling the national finances of the United States, was established by act of congress in September, 1789. It is presided over by a secretary appointed by the president, who is a member of the cabinet, and second among the cabinet officers in the line of succession to the presidency. The department employs some 5000 persons at Washington with numerous bureaus, branches, and offices throughout the country. The only qualification for the office of secretary of the treasury is the negative one that he shall not be interested in foreign commerce. He is required to prepare plans for the revenue and public credit; to superintend the collection of the revenues, etc., etc., and to perform all such duties relative to the finances as shall be required by law. The development of the department has been extended to the management of the national debt, the supervision of the national banks, the internal revenue system, the legal-tender currency, the merchant marine, the lighthouse system, the life-saving and marine hospital services, the coast survey, etc.

TREATY, an agreement, league, or contract between two or more nations or sovereigns formally signed by commissioners properly authorized, and ratified by the several sovereigns, or the supreme power of each state. Treaties are of various kinds, as treaties for regulating commercial intercourse, treaties of alliance, offensive and defensive, treaties of peace, etc. In most monarchies the power of making and ratifying treaties is vested in the sovereign; in republics it is vested in the chief magistrate, senate, or executive council; in the United States of America it is vested in the president by and with the consent of the senate. Treaties may be concluded and signed by diplomatic agents, but these, of course, must be furnished with full powers by the sovereign authority of their states.

TREBIZOND', a seaport in Asiatic Turkey, capital of a pashalic of the same name, on the Black sea. Pop. estimated at 50,000.

TREBLE, in music, the highest vocal or instrumental part in a concerted piece, such as is sung by women or boys, or played by instruments of acute tone, as the violin, flute, oboe, clarinet, etc., or on the higher keys of the piano, organ, etc.; so called because it was originally a third part added to the ancient *canto fermo* and the counterpoint.

TREE, a perennial plant having a woody trunk of varying size, from which spring a number of branches, having a structure similar to the trunk. Trees are thus distinguished from shrubs, which have perennial stems but have no trunk properly so called; and from herbs, whose stems live only a single year. It is difficult, however, to fix the exact limit between trees and shrubs. Trees are both endogenous and exogenous, by far the greater number both of individuals and of varieties belonging to the latter class. Those of which the whole foliage falls off periodically, leaving them bare in winter, are called deciduous; those of which the foliage falls only partially, a fresh crop of leaves being always supplied before the mature leaves are exhausted, are called evergreen. Trees are the longest lived organisms of the vegetable kingdom, and attain a great and indefinite age, far exceeding that of animals. The maximum age of different trees is as follows:

	Years.
Palm.....	250
Elm.....	355
Cypress.....	388
Ivy.....	448
Maple.....	510
Larch.....	576
Lemon.....	646
Plane.....	720
Cedar.....	800
Chestnut.....	860
Walnut.....	900
Lime.....	1,070
Spruce.....	1,206
Oak.....	1,600
Olive.....	2,000
Yew.....	2,880
Baobab.....	5,100
Dragon.....	5,900

Eucalyptus, or Australian gum-tree, sometimes grows twenty-four feet in three months; bamboo, two feet in twenty-four hours. See *Arboriculture*, *Botany*, *Timber*, etc.

TREE-CRAB, a crab of the genus included among the land-crabs. It breaks open the shell of the cocoa-nut, etc., by repeated blows of its great claws, in order to feed upon the soft pulp of the nut. Tree-crabs can live for long periods out of water, but deposit their eggs in the sea.

TREE-FERNS, the name given to several species of ferns which attain to the size of trees. They are found in tropical countries. A handsome species contains in its trunk a mucilaginous pulp comparable to sago, which is used extensively for food in Polynesia and New Zealand.

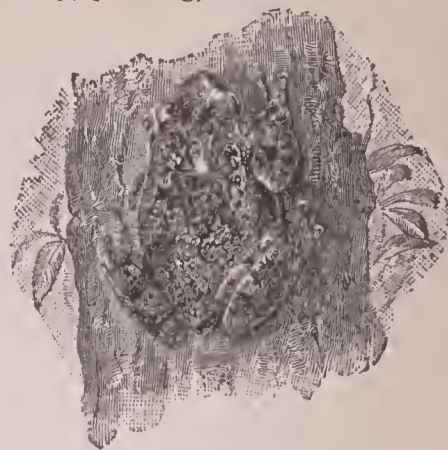
TREE-FROG, a name of frogs differing from proper frogs in the extremities of their toes, each of which is expanded into a rounded viscous pellet that enables the animals to adhere to the surface of bodies and to climb trees, where they remain during the summer feeding upon insects.

TREE-TOAD. See *Tree-Frog*.

TREFOIL, a distinctive title applied to plants of various kinds on account of a peculiarity of the form of the leaf, which consists of three leaflets; examples, buck bean, clover and medick. The same term is also applied to an ornamental foliation in Gothic architec-

TREPANG

ture, used in the heads of window lights, tracery, paneling, etc.



American tree-toad.

TREM'OLITE, a mineral, a variety of hornblende. It is a silicate of calcium and magnesiums, is white or colorless, and usually occurs in long, prismatic crystals.

TRENT, Council of, a celebrated œcumenical council of the Roman Catholic church, convened to settle various controversies that were agitating the church during the Reformation period, and for the reform of abuses. It met during the pontificate of Paul III. at Trent in 1545, but the wars in Germany caused its transference to Bologna in 1546, when it dispersed. Pope Julius III. again convoked it at Trent in 1551, but it dispersed a year later on the approach of the Lutherans. Eight years afterward it was again called together by Pius IV., and it finished its labors in 1563. This council definitely settled the doctrines of the Roman Catholic church. Its decrees are embodied in what is known as the Creed of Pius IV.

TRENTON, the capital of New Jersey, on the Delaware at the head of tide-water and steamboat navigation, 50 miles southwest of New York. It is laid out with great regularity, and has



State Capitol, Trenton, N. J.

a state-house, court-house, governor's house, state-prison, etc. There are numerous manufacturing establishments (earthenware, iron and steel, etc.), and the trade is extensive. Pop. 100,000.

TREPANG, the sea-slug, a marine animal popularly known as "sea-cucumbers," or *bêches-de-mer*. It is found chiefly about coral reefs in the Eastern seas, and is a rather repulsive looking animal, somewhat resembling the land slug in shape, and varying in length from 6 to 24 inches. Sun-dried

trepangs are in special request in China for making soups. The fishery is carried on in numerous localities in the Indian



Trepang.

ocean, the Eastern archipelago, and on the shores of Australia.

TREPANNING, the operation of cutting a circular opening into the skull by means of a surgical instrument called a trepan or trephine. This consists of a handle, to which is fixed a small hollow steel cylinder, of about $\frac{1}{2}$ to 1 inch in diameter, having teeth cut on its lower edge so as to form a circular saw. Trepanning is especially resorted to for the purpose of relieving the brain from pressure, as in fracture of the skull or in cerebral abscess.

TRESCOT, William Henry, American diplomatist, was born at Charleston, S. C., in 1822. In 1852 he became secretary of the United States legation in London, and was assistant secretary of state from June, 1860, until the secession of South Carolina. Among his published works are: *Diplomacy of the Revolution*, *An American View of the Eastern Question*, and *Diplomatic History of the Administrations of Washington and Adams*. He died in 1898.

TRESPASS, in law, a term which is applied generally to any offense against the person or property of another, but is more especially applied to a peaceful but unlawful entry upon the property of another, the remedy for which is by an action of damages. Any injuries committed against land or buildings are in the most ordinary sense of the word trespasses, as entering another's house without permission, walking over the ground of another, or suffering any cattle to stray upon it, or any act or practice which damages the property, or interferes with the owner's or occupier's rights of possession. A creditor or customer can be ordered away by a householder or shopkeeper, and even the civil courts have no power to give a right of entry to officers intrusted with the execution of legal processes, though such officers may maintain possession if once they gain entrance.

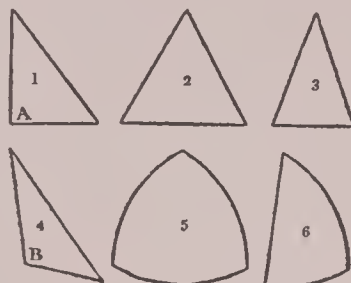
TREVEL'YAN, Sir George Otto, Bart., the only son of Sir Charles E. Trevelyan, and nephew of Lord Macaulay, born in 1838. He is author of the *Life and Letters of Lord Macaulay* (2 vols. 1876), *The Early History of Charles James Fox*, etc.

TREVES, a town in the province of Rheinland, Prussia, on the right bank of the Moselle. It is considered the oldest city in Germany, and contains many Roman remains. The chief buildings are the cathedral, built at various times from the 6th century downward, and containing the Holy Coat (see Holy Coat of Treves); Church of our Lady, an elegant Gothic structure; and the old archiepiscopal palace, now used as a barracks. Pop. 39,993.

TRIAL. See Jury and Procedure, Civil.

TRIANGLE, in geometry, a figure bounded by three lines and containing

three angles. The three angles of a plane triangle are equal to two right angles or 180° , and its area is equal to half that of a rectangle or parallelogram of the same base and altitude. The triangle is the most important figure in geometry, and may be considered the element of all other figures. If the three lines or sides of a triangle are all straight, it is a plane or rectilinear triangle, as in Figs. 1, 2, 3, 4. If all the three sides are equal, it is an equilateral triangle, as in Fig. 2. If two of the sides only are equal, it is an isosceles triangle, Fig. 3. If all the three sides are unequal, it is a scalene triangle, Fig. 4. If one of the angles is a right angle,



Triangles.

the triangle is right-angled, as Fig. 1, having the right angle at a. If one of the angles is obtuse, the triangle is called obtuse-angled, as Fig. 4, having the obtuse angle b. If all the angles are acute, the triangle is acute-angled, as Figs. 2, 3. If the three lines of a triangle are all curves, the triangle is said to be curvilinear, as Fig. 5. If one or two of the sides are straight and others are other curve, the triangle is said to be mixtilinear, Fig. 6. If the sides are all arcs of great circles of the sphere, or arcs of the same circle, the triangle is said to be spherical.

TRI'BUNE, in Roman antiquity, originally an officer connected with a tribe, or who represented a tribe for certain purposes; especially, an officer or magistrate chosen by the people to protect them from the oppression of the patricians or nobles, and to defend their liberties against any attempts that might be made upon them by the senate and consuls. These magistrates were at first two, but their number was increased to five and ultimately to ten. This last number appears to have remained unaltered down to the end of the empire. There were also military tribunes, officers of the army, each of whom commanded a division or legion, and also other officers called tribunes, as, tribunes of the treasury, of the horse, etc. See Rome (History).

TRICHINA (tri-kī'na), a minute nematoid worm, the larva of which was discovered in 1835 in the tissue of the voluntary muscles of man, giving rise to a disease since known as trichiniasis or trichinosis. The worm is common also to several other mammals, and especially to the pig, and it is generally from it that man receives the disease. When a portion of flesh, say of the pig, containing larvæ is taken into the stomach the larvæ in a few days becomes developed into procreative adult worms, having in the meantime passed into the intestines. The male worm is about $\frac{1}{16}$ th

of an inch long, the female about a half more. The female produces embryos in extraordinary numbers, which gain entrance into the muscles by penetrating the mucous coat of the intestine and entering the capillaries, whence they are carried to their habitat by the circulation. There they disorganize the surrounding tissue, setting up at the same time morbid action in the system, manifested by swelling of the face, body, and limbs, fever, pains, etc., and resulting sometimes in death. In the muscles they become quiescent, are encased in a cyst covered with calcareous matter, and may give no more trouble. Thorough cooking kills the trichinæ and thus prevents infection.

TRICHINOP'OLY, a town of British India, capital of district of same name, in the presidency of Madras, on the right bank of the Caverry. Pop. 104,721.

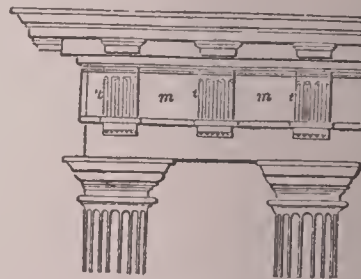
TRICOLOR, the French national flag, or one formed after the model of it. The French tricolor is blue, white, and red in equal vertical sections, the blue being next the flag-staff.

TRIDEN'TINE COUNCIL, the Council of Trent. See Trent.

TRIST', a seaport town in Austria, 214 miles southwest of Vienna, on a gulf of same name, at the northeastern extremity of the Adriatic. The chief buildings are an ancient cathedral in the Byzantine style, and the exchange block of buildings, which is a handsome edifice. Triest is the chief Austrian port, and the most important trading place in the Adriatic, and has now very extensive harbor accommodation. Pop. 178,672.

TRIFORIUM, in Gothic churches, a gallery or open space between the arches of the nave and the roof of the aisles below the clere-story lighted by windows opening into the interior of the building.

TRI'GLYPHS, in architecture, are ornaments in the frieze of the Doric order, repeated at equal intervals. Each triglyph consists of a square block, on



Frieze of Roman Doric Order.
ttt, Triglyphs. mm, Metopes.

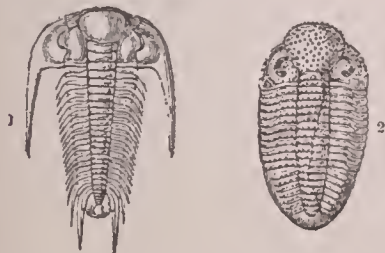
which are cut two perpendicular channels of triangular section, and one half channel on either side of these.

TRIGONOMETRICAL SURVEY, the survey of a country which is carried on from a single measured base-line, by trigonometrical computation made from observed angular distances. The most minute accuracy and the most perfect instruments are required in all the practical parts of such operations; and it becomes necessary to have regard to the curvature of the earth's surface, the effects of temperature, refraction, alti-

tude above the level of the sea, and a multitude of circumstances which are not taken into account in ordinary surveying. In conducting a trigonometrical survey of a country, signals, such as spires, towers, poles erected on elevated situations or other objects, are assumed at as great a distance as will admit of distinct and accurate observations by means of telescopes of considerable power attached to the instruments used in measuring the angles. In this way, starting from a measured baseline, the country will be divided into a series of connected triangles called primary triangles; and any side of any one of these being known the remaining sides of all of them may be computed by trigonometry. By means exactly similar, each of these triangles is resolved into a number of others called secondary triangles; and thus the positions of towns, villages, and other objects are determined. The length of the base or line measured, which is an arc of a great circle, must be determined with extreme accuracy, as an error in measuring it would affect the entire survey.

TRIGONOMETRY, the science of the measurement of triangles. Trigonometry is of two kinds, plane and spherical the former treating of triangles described on a plane, and the latter of those described on the surface of a sphere. In every triangle there are six things which may be considered, viz.: the three sides and the three angles, and the main object of the theoretical part of trigonometry is to deduce rules by which, when some of these are given, the others may be found by computation. In plane trigonometry any three of the six parts of a triangle being given (except the three angles), the other parts may be determined; but in spherical trigonometry, this exception has no place, for any three of the six parts being given, the rest may thence be determined, the sides being measured or estimated by degrees, minutes, etc., as well as the angles. Both plane and spherical trigonometry is divided into right-angled and oblique-angled. Solutions of triangles are worked by means of tables of the values of the trigonometrical functions, and the processes are much facilitated by the use of logarithms. See Logarithm.

TRILOBITES, an extinct and widely-distributed family of palæozoic crustacea, nearly allied to the Phyllopora. Trilobites are especially characteristic



Trilobites.

1, *Paradoxides bohemicus*. 2, *Phacops latifrons*.

of the Cambrian and Silurian strata; a number of genera appear in the Devonian, a few in the Carboniferous, none higher. They are named from the fact that the body is divided into three lobes,

which run parallel to its axis. They feed on small water animals, and vast numbers inhabited the shallow water near coasts. When attacked they could roll themselves into a ball. Up till recent times no antennæ or limbs belonging to these animals were known, but latterly a certain number have been found. The eye-lenses are frequently beautifully preserved so as to be perceptible by the naked eye. In one species each eye has 400 facets, and in another 6000. The species vary greatly in size, some being no larger than a pin's head.

TRI'LOGY, a series of three dramas, each of them in a certain sense complete in itself, yet bearing a mutual relation to each other, and forming but parts of one historical and poetical picture. The term belongs more particularly to the Greek drama, where three tragedies, connected in subject, together with a humorous piece, were performed in immediate succession.

TRINIDAD', one of the British West India islands, and, excepting Jamaica, largest and most valuable. It is the most southerly of the Windward group, lies immediately off the northeast coast of Venezuela, and is about 55 miles long by 40 miles broad; area, 1755 sq. miles. The chief products are sugar, cocoa, molasses, rum, cocoa-nuts, pitch, timber, and fruits. The climate is healthy, and though hot is well suited to Americans. The chief exports are sugar, rum, cocoa, molasses, and pitch. The capital, Port of Spain, on the northwest side of the island, is one of the finest towns in the West Indies. Pop. 260,815.

TRINITY, a theological name given to the Deity as expressive of the Christian doctrine of the Triune nature of God, the union of the Father, the Son, and the Holy Spirit as Three Persons and One God. The doctrine of the Trinity is nowhere expressly taught in the Old Testament, but in the New Testament it is clearly taught, though the word Trinity does not occur. The definition of the Trinity adopted by the Catholic church, and generally accepted by orthodox Christians, is that there are in the Godhead three persons, one in substance, co-eternal, equal in power, the Father, Son, and Holy Ghost. The Eastern church holds that the Holy Ghost proceeds from the Father; the Western, throughout all its divisions, adopting the amended form of the Nicene Creed, holds that he proceeds from the Father and the Son. The three creeds commonly called the Apostles', the Athanasian, and the Nicene, all contain the points of agreement between the two divisions of the church, while on the point of difference the Athanasian and the commonly known form of the Nicene express the faith of the Western church. The term persons is not used in Scripture of the Trinity, but something analogous to the conception of personality seems to be implied in the apostolic arguments of the epistles.

TRINITY SUNDAY, the Sunday after Whitsunday. It was definitely established as a church festival by Pope John XXII. in 1334. All the principal feasts occur in the half-year between Advent Sunday and Trinity, and all the Sun-

days from Trinity to Advent are called Sundays after Trinity.

TRIPLE ALLIANCE. Four treaties in European politics are known by this name. The first was formed in 1668 by Great Britain, Sweden, and the Netherlands against Louis XIV.; the second in 1717 by Great Britain, France, and Holland against Spain, then governed by Cardinal Alberoni; the third by Great Britain, Russia, and Austria against France (1795); the fourth by Germany, Austria-Hungary, and Italy, in the interests of peace (1887).

TRIPLET, in music, a combination of three notes to be played in the time of two. They are joined by a slur and distinguished by having the figure 3 above them.

TRIPOD, anciently a bronze altar consisting of a caldron raised on a three-legged stand of bronze. Such was the altar of Apollo at Delphi. Tripods of



Antique tripod.

fine workmanship and of precious metals were placed in later times as votive gifts in the temples, especially that of Apollo.

TRIP'OLI, a country in the north of Africa, forming a portion of the Turkish empire since 1835, is bounded on the north by the Mediterranean, west by Tunis, south by Fezzan and the Libyan Desert, and east by the Libyan Desert and Barca; area, about 106,000 sq. miles, and with Fezzan and Barca, which are included in the Turkish vilayet, about 344,000 sq. miles. The population, which in the outlying districts consists of Berbers and Bedouins and in the town chiefly Moors, is estimated at 1,150,000.—Tripoli, the capital, stands on a tongue of land projecting into the sea. Pop. about 30,000.

TRIPTYCH (trip'tik), a picture, carving, or other representation in three compartments side by side; most fre-



Triptych—Painting by Allegretto Nucci, 1465.

quently such as is used for an altar-piece. The central picture is usually complete in itself. The subsidiary

designs on either side are smaller, and frequently correspond in size and shape to one half of the principal picture.

TRI'EME, a galley or vessel with three benches or ranks of oars on a side, a common class of warship among the ancient Greeks, Romans, Carthaginians, etc. The trireme was also provided with a large square sail, which could be raised during a fair wind to relieve the rowers, but was never employed in action.

TRITONS, in Greek mythology, the name of certain sea-gods. They are variously described, but their body is always a compound of the human figure



Triton with Nereid—From an antique sculpture in the Vatican.

above with that of a fish below. They carry a trumpet composed of a shell, which they blow at the command of Poseidon to soothe the waves.

TRI'UMPH, in Roman antiquity, a magnificent procession in honor of a victorious general, and the highest military honor which he could obtain. It was granted by the senate only to one who had held the office of dictator, of consul, or of prætor, and after a decisive victory or the complete subjugation of a province. In a Roman triumph the general to whom this honor was awarded entered the city of Rome in a chariot drawn by four horses, crowned with laurel, and having a scepter in one hand and a branch of laurel in the other. He was preceded by the senate and the magistrates, musicians, the spoils, the captives in fetters, etc., and followed by his army on foot, in marching order. The procession advanced in this order along the Via Sacra to the capitol, where a bull was sacrificed to Jupiter, and the laurel wreath deposited in the lap of the god. Banquets and other entertainments concluded the solemnity. A naval triumph differed in no respect from an ordinary triumph, except that it was upon a smaller scale, and was characterized by the beaks of ships and other nautical trophies.

TRIUM'VIR, one of three men united in office. The triumvirs of Rome were either ordinary magistrates or officials, or else extraordinary commissioners who were frequently appointed to jointly execute any public office. But the men best known in Roman history as triumvirs were rather usurpers of power than properly constituted authorities. The term triumvirate is particularly applied in Roman history to two famous coalitions, the first in 59 B.C. between Cæsar, Pompey, and Crassus; the second in 43 B.C. between Antony, Octavian, and Lepidus. See Rome (History).

TROAD. See Troy.

TROCHEE, in prosody, a foot of two syllables, the first long and the second short, as Lat. fâma, or Eng. nation.

TROCHILIDÆ. See Humming-bird.

TROCHU (tro-shü), Louis Jules, French general, born in 1815, died in 1896; educated at St. Cyr; engaged in the Algerian, Crimean, and Italian campaigns; published a pamphlet entitled *L'Armée Française en 1867*, and showed the weakness of the French army, by which he forfeited the favor of Napoleon. At the outbreak of the Franco-German war (1870), however, he was made governor of Paris, and when the republic was proclaimed he was intrusted with the defense of the city, a position which he held until the capitulation.

TROG'LODYTE, a cave-dweller; one dwelling in a cave or underground habitation. The ancient Greeks gave the name to various races of savages inhabiting caves, especially to the cave-dwellers on the coast of the Red sea and along the banks of the Upper Nile in Nubia and Abyssinia, the whole of this district being known by the name Troglodytikê. Archæological investigations show that cave-dwellers everywhere probably preceded house-builders.

TROLLOPE, Anthony, English novelist, was born in London 1815, died 1882. His first success was *The Warden*, followed by *Barchester Towers*, *Dr. Thorne*, *The Bertrams*, *Framley Parsonage*, *The Last Chronicles of Basset*, *Phineas Finn*, *The Way We Live Now*, etc. He also published accounts of his travels, besides a *Life of Cicero*, a sketch of *Thackeray's Life*, and his own *Autobiography*.

TROLLS, in Northern mythology, a name of certain supernatural beings, in old Icelandic literature represented as a kind of giants, but in modern Scandinavia regarded as of diminutive size, and represented as a kind of mischievous imps or goblins.

TROMBONE, a deep-toned brass instrument of the trumpet kind, consisting of three tubes; the first, to which the mouthpiece is attached, and the third, which terminates in a bell-shaped orifice, are placed side by side; the middle tube is doubled, and slides into



1, Valve trombone. 2, Slide trombone.

the other two like the tube of a telescope. By the manipulation of the slide the tube of air is altered in length, and the pitch accordingly varied. The trombone is of three kinds, the alto, the tenor, and the bass; and some instruments are fitted with pistons when they are known as valve trombones.

TROMP, Martin Harpertzoon, the son of a Dutch naval officer, was born at Briel in 1597. He went to sea with his father in 1607; received the appointment of lieutenant-admiral; gained a decisive victory over the Spanish and Portuguese fleet near Dunkirk in 1639; encountered

Blake and Monk in 1653, and in the same year he again encountered Monk and was killed in the battle.

TROOPIAL, the name common to a group of passerine birds, akin to the orioles and starlings. They mostly inhabit the southern United States, but several of them appear as birds of passage in the northern states in early spring. The cow-troopial, cow-bird, or cow-bunting, the blue-bird, and the bobolink or rice-bunting, belong to this group. See these articles.

TROPIC-BIRD, the common name of the natatorial or swimming birds belonging to the pelican family, peculiar to tropical regions. They are distinguished



Tropic-bird.

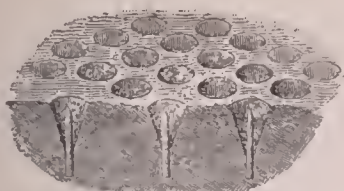
by two very long, slender tail-feathers. They are wonderfully powerful on the wing, being able to pass whole days in the air without needing to settle.

TROPICS, in astronomy, two circles on the celestial sphere, whose distances from the equator are each equal to the obliquity of the ecliptic, or $23\frac{1}{2}^{\circ}$ nearly. The northern one touches the ecliptic at the sign Cancer, and is thence called the tropic of Cancer, the southern one being for a similar reason called the tropic of Capricorn. The sun's annual path in the heavens is bounded by these two circles, and they are called tropics, because when the sun, in his journey northward or southward, reaches either of them, he, as it were, turns back, and travels in an opposite direction in regard to north and south. Geographically the tropics are two parallels of latitude, each at the same distance from the terrestrial equator as the celestial tropics are from the celestial equator. The one north of the equator is called the tropic of Cancer, and that south of the equator the tropic of Capricorn. Over these circles the sun is vertical when farthest north or farthest south, that is, at the solstices, and they include between them that portion of the globe called the torrid zone, a zone 47° wide, having the equator for its central line.

TROU'BADOUR, a name given to a class of early poets who first appeared in Provence, in France. They flourished from the 11th to the latter part of the 13th century, their principal residence being the south of France, but they also lived in Catalonia, Arragon, and North Italy. The most renowned among the troubadours were knights who cultivated music and poetry as an honorable accomplishment; but their art declined in its later days, when it was chiefly cultivated by minstrels of a lower class.

TROUS-DE-LOUP

TROUS-DE-LOUP (trō-dē-lō), a military term for trap-holes or pits dug in the ground in the form of inverted cones



Trous-de-loup.

or pyramids, in order to serve as obstacles to the advance of an enemy each pit having a pointed stake in the middle.

TROUT, the common name of various species of salmon, as the bull-trout, the salmon-trout, the common trout, and the great gray or lake trout. The common trout abounds in all the rivers and lakes of Northern Europe, and is found even in the smallest streams. The brook-trout of America and the common American lake-trout are among several species of lake-trout in America, among the finest and largest of which is the Mackinaw trout. The great gray or lake trout of Britain weighs sometimes 30 lbs., while the North American lake-trout may reach 60 lbs.

TROY, or **ILIUM**, an ancient city in the Troad, a territory in the northwest of Asia Minor, south of the western extremity of the Hellespont rendered famous by Homer's epic of the Iliad. The ancient and legendary city, according to the Homeric story, reached its highest splendor when Priam was king; but the abduction of Helen, wife of Menelaus, king of Sparta, by Paris, one of Priam's sons, brought about its destruction. To revenge this outrage all the Greek chiefs afterward famous in history banded themselves against the Trojans and their allies, and went against Troy with a great fleet. The first nine years of the war were spent by the Greeks in driving the Trojans and their allies within the walls of the capital. The tenth year brought about a quarrel between Achilles, the bravest of the Greeks, and Agamemnon, the Greek commander-in-chief, which proved for a time disastrous to their party, and which forms the subject of the Iliad. In the end the city was taken by means of a large hollow wooden horse, in which a number of the bravest of the Greek heroes concealed themselves, while the rest retired to their ships. Thinking that the Greeks had given up the siege, the Trojans incautiously drew the horse within the city, and gave themselves up to revelry. The Greeks within the horse issued from their concealment, and being joined by their companions without the walls, Troy was taken and utterly destroyed. This is said to have occurred about 1184 B.C.

TROY, the capital of Rensselaer co., New York, on the left bank of the Hudson river. It has a fine court-house, a lyceum, a celebrated female institute, a public library, a government arsenal, etc. It has paper, saw, cotton, and flour mills; manufactures of leather, woolen cloth, cordage, earthenware; and ships large quantities of lumber, flour, grain, beef, pork, wool, etc. Pop. 1909, 76,000.

TROY WEIGHT, a weight chiefly used in weighing gold, silver, and articles of jewelry. The pound troy contains 12 ounces; each ounce is divided into 20 pennyweights, and each pennyweight into 24 grains. Hence the pound contains 5760 grains, and the ounce 480 grains. As the avoirdupois pound (the weight in general commercial use) contains 7000 grains, and the ounce 437½ grains, the troy pound is to the avoirdupois as 144 to 175, and the troy ounce to the avoirdupois as 192 to 175.

TRUFFLE, a genus of fungi growing underground. The common truffle is of a fleshy fungous structure and roundish figure, without any visible root; of a dark color, approaching to black, and studded over with tubercles, and varies in size from that of a large plum to that of a large potato. It is much sought after as an ingredient in certain high-seasoned dishes. There being no appearance above-ground to indicate the existence of the truffle, dogs are trained to find this fungus by the scent and scratch it up.

TRUMBULL, John, American historical and portrait painter, was born at Lebanon, Conn., in 1756. In 1784 he went to Paris, where he painted his first historical picture, "The Signing of the Declaration of Independence," which, with the "Surrender of Burgoyne," "Surrender of Cornwallis," "Resignation of Washington at Annapolis," hang in the capitol at Washington. Among his principal works are the "Battle of Bunker Hill," "Death of Montgomery," "Battle of Princeton," "Battle of Trenton," and portraits of Washington, Hamilton, the Duke of Wellington, and others. In 1794 he was secretary of legation in England; and from 1816 to 1825 was president of the Academy of Fine Arts, New York, in which city he died November 10, 1843.

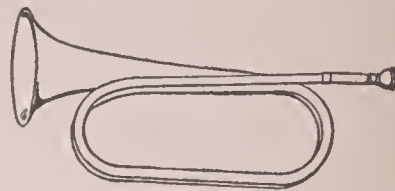
TRUMBULL, Jonathan, an American patriot and political leader, was born at Lebanon, Conn., in 1710. From 1769 to 1783 he was governor of Connecticut, was the only one of the colonial governors who gave his unqualified support of the patriot party. According to a long accepted tradition he was called by Washington "Brother Jonathan," a phrase which later came into general use to personify the United States. He died in 1785.

TRUMBULL, Lyman, American jurist, was born at Colchester, Conn., in 1813. He moved to Illinois in 1837. In 1841 he became secretary of state, and in 1848 was elevated to the supreme bench of the state. He was elected to congress as a Democrat in 1854, and while serving as representative was chosen United states senator for the term commencing March 4, 1855. In 1861 he was reelected to the senate, where he took an active part in securing the passage of the constitutional amendment providing for the abolition of slavery, and was one of the republicans who voted against the impeachment of Andrew Johnson. Since that occurrence he had acted with the democratic party, having been the democratic nominee for governor of Illinois in 1880. He died in 1896.

TRUMPET, a wind-instrument of

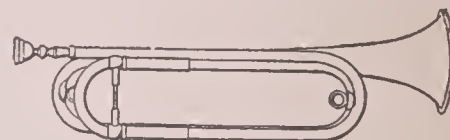
TRUSTEE

music of the highest antiquity, having a clear ringing and penetrating tone. In its modern form it consists of a metal tube (usually brass, sometimes silver), about 8 feet long, doubled up in the form of a parabola, becoming conoid



Cavalry trumpet.

in the last fold, and expanding into a bell-shaped end, the other end being fitted with a mouthpiece by which the instrument is sounded. By means of crooks and slides the length of the tube



Orchestral trumpet.

can be increased, and the pitch correspondingly lowered. Trumpets are also sometimes fitted with pistons, valves, or keys, by which the intermediate tones and semitones can be produced.

TRUMPETER, a genus of grallatorial or wading birds, found in South America, and so named from their hollow cry. The most familiar species is the golden-breasted trumpeter, a bird of the size of a pheasant, which is readily tamed, and becomes a favorite inmate of the house.

TRUMPETS, Feast of, a feast among the Jews, held on the first and second days of the month Tisri, which was the commencement of the Jewish civil year. It derived its name from the blowing of trumpets in the temple with more than usual solemnity.

TRUNK-HOSE, a kind of short wide breeches gathered in above the knees, or immediately under them, and distinguished according to their peculiar



Trunk-hose.

1. Charles IX. of France, 1550-1574.

2. Robert Carr, Earl of Somerset, died 1645.

cut as French, Gallic, or Venetian. This garment prevailed during the time of Henry VIII., Elizabeth, and James I.

TRUSTEE, in law, a person to whom property is legally committed in trust for the benefit of some other party or

parties, or for some special purpose. The person for whom or in whose favor the trustee holds the estate, or any interest therein, is called the cestui que trust. No one is compelled to undertake a trust, but if he once accepts he cannot renounce it unless the trust-deed contains a provision enabling him to do so, or a competent court grants him a discharge, or by the consent of all those beneficially interested in the estate. Trustees are liable for the consequences of any breach of trust however innocent, and the estate of a trustee deceased, who has misapplied the trust fund, is liable for the deficiency; but generally speaking, the law only requires of a trustee the same amount of care and prudence he would be expected to display in managing his own affairs. Where there are several trustees, each is liable for his own acts and receipts only, unless where there has been common agreement and organization. As their office is considered purely honorary, trustees are not entitled to any allowance for their trouble in connection with the trust. They may not invest the trust-funds on personal security, or in stock of a private company, unless specially authorized to do so by the trust-deed; but they are permitted to invest in government stocks, debenture, preference, or guaranteed stock of railways, stock of municipal corporations, and generally on satisfactory real security.

TSETSE-FLY, a South African two-winged insect akin to the gad-fly, whose bite is often fatal to horses, dogs, and cows, but is innocuous to man and wild beasts. It is a little larger than the common house-fly, and the symptoms of its bite are that the eyes and the nose begin to run, the coat stares as if the



Tsetse, four times natural size.

animal were cold, a swelling appears under the jaw and sometimes at the navel, and if the animal does not die at once, emaciation commences, accompanied with a peculiar flaccidity of the muscles, and this continues unchecked until, perhaps months afterward, purging comes on, and the animal perishes in a state of extreme exhaustion.

TUBER, in botany, an underground fleshy stem or appendage to the root, being usually an oblong or roundish body, of annual duration, composed chiefly of cellular tissue with a great quantity of amylaceous matter, in-

tended for the development of the stems or branches which are to spring from it, and of which the rudiments, in the form



Tuberous roots.

of buds, are irregularly distributed over its surface. Examples are seen in the potato, the Jerusalem artichoke, and arrow-root.

TUBERCULOSIS, the term applied to a general disease due to the formation of tubercles in various organs of the body. The prevalence of tuberculosis in cattle, and the possibility of tuberculosis cattle communicating the disease to human beings through the medium of the meat of slaughtered animals sold for food, have recently occasioned profound anxiety and much discussion. See Consumption.

TUBEROSE, a plant originally brought from the East, cultivated both for its perfume and for its beautiful white flowers. It has a bulbous root, and an upright branchless stem growing to the height of 3 or 4 feet.

TUBULAR BRIDGE. See Bridge.

TUCKAHOE, a singular vegetable found in the southern seaboard states of the United States, growing underground, like the European truffle. It is also called Indian bread and Indian loaf. It is referred to a genus of spurious fungi, but in all probability it is a peculiar condition of some root, though of what plant has not been properly ascertained.

TUCUMAN, or San Miguel de Tucuman, a town of the Argentine republic, capital of the province of same name. Pop. about 34,300. The province is fertile, and has a fine climate; area, 13,500. Pop. 249,433.

TUDOR, the family name of an English royal line founded by Owen Tudor of Wales, who married the widowed queen of Henry V. The first of the Tudor sovereigns was Henry VII.; the last, Elizabeth.

TUDOR STYLE, in architecture, a name frequently applied to the latest Gothic style in England, being the last phase of the perpendicular, and sometimes known as Florid Gothic. The period of this style is from 1400 to 1537; but the term is sometimes extended so as to include the Elizabethan period also, which brings it down to 1603. It is the result of a combination of the Italian style with the Gothic. It is characterized by a flat arch, shallow mouldings, and a profusion of panelling on the walls.

TUESDAY, the third day of our week, so called from the Anglo-Saxon god of war, Tiu.

TUILERIES (twēl-rēz; from Fr. tuile, a tile, because the spot on which it was built was formerly used for the manufacture of tiles), the residence of the French monarchs, on the right bank of the Seine, in Paris. Catharine de' Medici, wife of Henry II., began the

building (1564); Henry IV. extended it, and founded the old gallery (1600); and Louis XIV. enlarged it (1654), and completed that gallery. The side toward the Louvre consisted of five pavilions and four ranges of buildings; the other side had only three pavilions. During the revolution of 1830 the palace was sacked. It was restored by Louis Philippe to its former splendor, but in 1848 it was again pillaged. The Tuileries then became a hospital for wounded, a picture-gallery, and the home of Louis Napoleon in 1851. On the 23d May, 1871, it was almost totally destroyed by fire (the work of the communists), and the remaining portions were removed in the year 1883.



Tudor architecture; Hengrave hall, Suffolk, 1538.

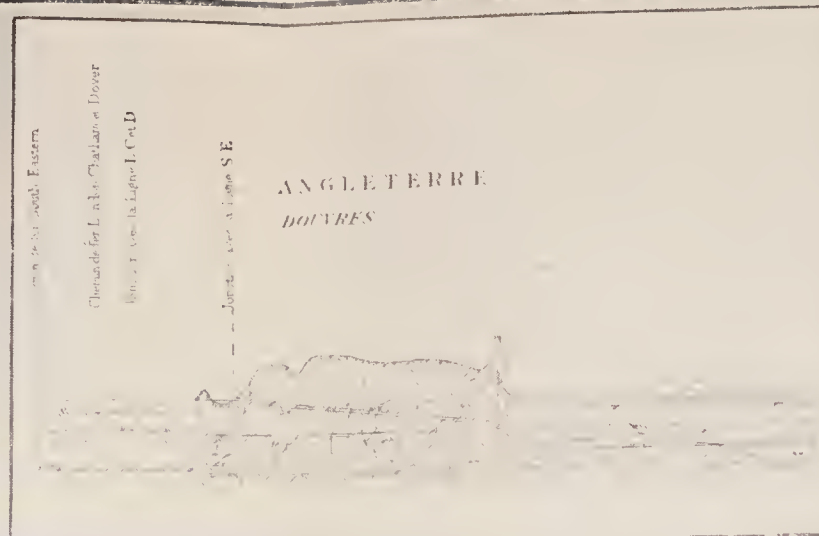
TULA, a government of Central Russia; area, 11,954 sq. miles. Pop. 1,409,432.—Tula, the capital, is situated on the Upa, 107 miles south of Moscow. It is the residence both of a civil and a military governor, the see of a bishop, and has extensive manufactures of fire-arms, as also cutlery, ornamental steel-work, platina snuff-boxes, silks, hats, soap, candles, cordage, and leather. Pop. 111,048.

TULIP, a genus of plants. The species are bulbous herbaceous plants, and are extensively cultivated in gardens. About forty species have been described, of which the most noted is the common garden tulip, a native of the Levant. Upward of 1000 varieties of this plant have been enumerated. The sweet-scented tulip is much prized for its fragrance. About the middle of the 17th century an extraordinary tulip mania prevailed in Holland. Enormous sums were given for bulbs, the ownership of a bulb being often divided into shares, in which men speculated as they do in ordinary stocks or shares.

TULIP-TREE, an American tree bearing flowers resembling the tulip. It is one of the most magnificent of the forest trees in the temperate parts of North America. Throughout the states it is generally known by the name of poplar, white wood, or canoe-wood. The wood is light, compact, and fine-grained, and is employed for various useful purposes. The bark, especially of the roots, has an aromatic smell and bitter taste, and has been used in medicine as a tonic and febrifuge.



England—The Works Above the Existing Tunnel Near Dover



France—The Chalk Cliffs at Sangatte which Repeat the British Formation



England—Abbots Cliff Near Dover

It is proposed to build two parallel tunnels, each 13 ft. wide, with a separate drainage tunnel to carry off any water which may ooze into the train tunnels. The quantity, however, is not expected to be great for the existing British portion when viewed five years after its construction showed only a slight dampness on its polished chalk walls. From 8,000 soundings which have been taken the engineers do not doubt that this grey-chalk band extends uniformly to where it reappears on the French coast near Sangatte, west of Calais. In mid-channel the tunnels would have 150 ft. of this impervious chalk above them.



France—Cutting through the Chalk for Existing Tunnel

THE REVIVAL OF THE TUNNEL SCHEME BETWEEN ENGLAND AND FRANCE. HOW THE TUNNELS WOULD BE CONSTRUCTED

TUMOR

TUMOR, in surgery, in its widest sense, a morbid enlargement or swelling of any part of the body or of any kind; more strictly, however, it implies a permanent swelling occasioned by a new growth, and not a mere enlargement of a natural part, which is called hypertrophy. Tumors may be divided into two well-defined classes: (a) Simple, benign, or innocent tumors, the substance of which has anatomical resemblance to some tissues of the body; they gradually increase in size, and generally only produce inconvenience from the great bulk they sometimes attain; a complete cure may be effected by simple excision. (b) Malignant tumors, which bear no resemblance in substance to normal tissue; they are exceedingly liable to ulceration, they invade all the textures of the part in which they occur, affecting the mass of the blood, and terminate fatally; when excised they are apt to recur not only in the immediate neighborhood of the previous site, but also in remote parts of the body. This recurrence in remote parts is due to transference of some of the elements of the tumor by means of lymphatic or blood vessels. Hence if a malignant tumor is to be excised it must be done early to avoid such secondary infection if possible. Innocent tumors are often named from the tissues in which they occur, as adipose, or fatty tumors, fibrous tumors, cartilaginous tumors, bony tumors, and the like. Of the malignant class cancer is a well-known example. See Cancer.

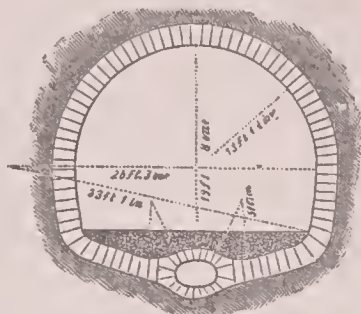
TUNGSTEN, a metal discovered in 1781; atomic weight 184. It has a grayish white color and considerable luster. It is brittle, nearly as hard as steel, and less fusible than manganese. The ores of this metal are the native tungstate of lime and the tungstate of iron and manganese, which latter is also known by the name of wolfram.

TUNIC, an ancient form of garment in constant use among the Greeks. Among the Romans the tunic was an under garment worn by both sexes (under the toga and the palla), and was fastened by a girdle or belt about the waist. The term is also used ecclesiastically to denote a dress worn by the sub-deacon, made originally of linen, reaching to the feet, and then of an inferior silk, and narrower than the dalmatic of the deacon, with shorter and tighter sleeves.

TUNIS, a country of North Africa, now a French protectorate, is bounded on the north and northeast by the Mediterranean, on the southeast by Tripoli, and on the west and southwest by Algeria; area, estimated at 42,000 sq. miles. The manufactures consist chiefly of woolen fabrics, soap, dyed skins, and ordinary and morocco leather. The inhabitants consist of a mixture of Moors and Arabs, along with Berbers, here called Kroumirs, occupying the elevated tract north of the valley of Mejerdah. Almost the only building of importance is the palace of the bey in the Moorish style; the bazaars are also interesting, and under French direction a cathedral and other buildings, have been erected, and schools, etc., established. Tunis has been recently connected directly with the Mediterranean by a deep channel

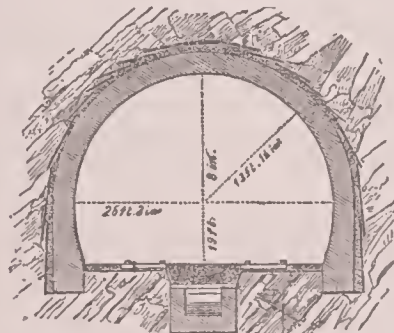
cut through the lagoon. Pop. about 170,000.

TUNNEL, a subterranean passage cut through a hill, a rock, or any eminence, or under a river, a town, etc., to carry a canal, a road, or a railway in an advantageous course. In the construction of canals and railways tunnels are frequently had recourse to in order to preserve the desired level and for various



St. Gothard tunnel. Section showing construction in soft strata.

other local causes. Tunnels when not pierced through solid rock have usually an arched roof and are lined with brick-work or masonry. The sectional form of the passage is various. Among the greatest works of this kind are the tunnels of St. Gothard, Mont Cenis, the Arlberg, and the Simplon. In Britain the Severn and Mersey tunnels are noteworthy, while in America the Hoo-



St. Gothard tunnel. Section near entrance on Italian side.

sac tunnel; that through the Cascade range in Washington and that under the St. Clair river connecting Detroit, Mich., and Windsor, Ont., are the most important. In recent years tunnels have been constructed to carry rapid transit railways under city streets and under rivers to connect cities such as those opened in 1908 between New York and Brooklyn and New York and Jersey City. See Subways.

TUNNY, a fish closely allied to the mackerel. These fish live in shoals in almost all the seas of the warmer and temperate parts of the earth. They are taken in immense quantities on the Mediterranean coasts, where the fishing is chiefly carried on. The flesh is delicate and somewhat resembles veal. The common tunny attains a length of from 4 feet to even 20 feet, and sometimes exceeds half a ton in weight. Its color is a dark blue on the upper parts, and silvery white below. The American tunny is found on the American coast from New York to Nova Scotia.

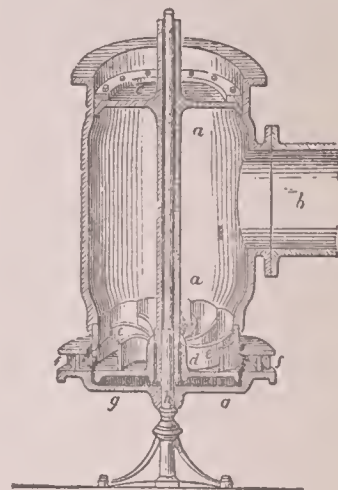
TUPPER, Martin Farquhar, born in London 1810, died 1889. He published a number of novels and plays, but his

TURBINE

fame rests upon his Proverbial Philosophy, a work in a kind of blank verse which has gone through numerous editions.

TURBAN, a form of head-dress worn by the Orientals. It varies in form in different nations, and different classes of the same nation. It consists of two parts; a cap without a brim, fitted to the head; and a sash, scarf, or shawl, usually of cotton or linen, wound about the cap, and sometimes hanging down the neck.

TURBINE, a kind of horizontal water-wheel, made to revolve by the escape of water through orifices, under the influence of pressure derived from a fall. Turbines are now made after a vast variety of patterns. The oldest and simplest is the Scotch turbine, or Barker's mill. In another common form

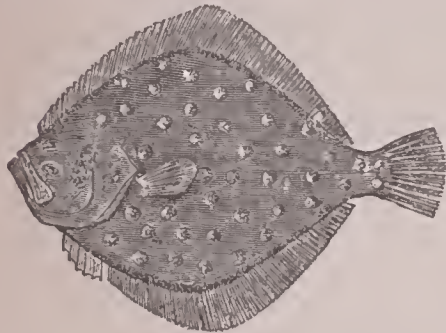


Section of turbine.

the water passes vertically down through the wheel between the fixed screw blades which give it a spiral motion, and then strike similar blades attached to a movable spindle, but placed in the opposite direction, so that the impact of the water communicates a rotary motion to the blades and spindles. Or the water may be passed from the center horizontally outward through fixed curved blades, so as to give it a tangential motion, and thereby cause it to act on the blades of the wheel which revolves outside. In the annexed cut the water is introduced into a close cast-iron vessel a by the pipe b, connecting it with the reservoir. Here, by virtue of its pressure, it tends to escape by any aperture which may be presented; but the only apertures consist of those between a series of curved float-boards ff, fixed to a horizontal plate g, mounted upon a central axis h, which passes upward through a tube connecting the upper and lower covers, c and d, of the vessel a. Another series of curved plates ee, is fixed to the upper surface of the disc d, to give a determinate direction to the water below before flowing out at the float-boards, and the curves of these various parts are so adjusted as to render the reactive force of the water available to the utmost extent in producing a circular motion, and thus carrying round the disc and the axis h with which the machinery to be impelled is connected. The steam turbine is a form of motor in which the moving force of expanding steam acts upon a wheel

provided with vanes so as to cause rotation. In the ordinary method of using steam it is admitted into a closed cylinder where it acts upon a movable piston; in the steam turbine the power is developed by particles of steam expanding from one pressure to another.

TURBOT, a well-known and highly esteemed fish. Next to the halibut, the turbot is the largest found on the British coast, and is the most highly esteemed for the table. It is of a short and broad form, brown on the upper side, which is



Turbot.

usually the left side, and attains a large size, sometimes weighing from 70 to 90 lbs. The American or spotted turbot, common on the coasts of New England and New York, attains a weight of 20 lbs.

TURENNE, Henri de la Tour d'Auvergne, Vicomte de, Marshal of France, born in 1611 at Sedan. He entered the service of France in 1630, served with distinction in Germany and North Italy, and in 1643 received the command of the army of the Rhine in the Thirty Years' war, and was made a marshal. His successes in this post, as in the battle of Nördlingen (1645), greatly contributed to the close of the war. During the disturbances of the Fronde the victories of Turenne led to the termination of the civil war. In the war against Spain he also distinguished himself, and after its close in 1659 he was named marshal-general of France. When war was renewed with Spain in 1667 he conquered Flanders in three months. In the Dutch war of 1672 Turenne had the chief command. He first marched against the elector of Brandenburg, and having driven him back as far as the Elbe forced him to sign the Treaty of Vossem in 1673; while in the brilliant campaign of 1674-75 he destroyed two Austrian armies by the battles of Mülhausen and Türkheim, and conquered and devastated the Palatinate. In 1675 he was killed while making preparations to engage Montecuculi.

TURGOT (tur-gô), Anne Robert Jacques, was born at Paris in 1727, and died 1781. Shortly after the accession of Louis XVI. in 1774 Turgot was appointed comptroller-general of France, and in order to reform the political and financial condition of the country, he moderated the duties on articles of the first necessity, freed commerce from many fetters, and encouraged industry by enlarging the rights of individuals, and abolishing the exclusive privileges of companies and corporations. Such, however, was the opposition of the

clergy and nobility to his reforms that he was dismissed from office in 1776, and retired into private life.

TURGUENEFF. See Tourguenieff.

TURIN, a city of North Italy, capital of province of same name, at the confluence of the Dora Riparia with the Po, and between those two rivers. The manufactures consist, besides the staple of silk, chiefly of woollens, cottons, linen paper, ironmongery, earthenware, and porcelain. Turin was anciently the capital of a tribe called the Taurini, and under the Roman empire was called Augusta Taurinorum. It was long the capital of Savoy, then of the Sardinian kingdom, and from 1861 to 1865 of United Italy. Pop. 335,639.

TURKESTAN, a wide region of Central Asia, roughly divided into two portions, Eastern Turkestan and Western Turkestan. Eastern or Chinese Turkestan is inclosed on three sides by lofty mountain ranges (Thian-Shan, Karakorum, Kuen-Lun), and on the east has the desert of Gobi. The products include cereals, root-crops, and cotton in large quantities, partly manufactured in the country. Carpets and felt cloths, along with silk, which the country produces abundantly, are exported to India, Kashmere, and Tibet; while opium, tea, linens and woollens are imported. The chief towns are Kashgar and Yarkand, and the population is estimated at 580,000.—Western Turkestan comprises the southern portion of Russian Central Asia, from Eastern Turkestan to the Caspian, and includes the khanates of Khiva and Bokhara. Corn, millet, rice, and cotton are cultivated in many places, and trade has greatly increased since the Russian occupation. The population may amount to 6,000,000. A portion of this territory forms the Russian general-government of Turkestan; area, 410,000 sq. miles; pop. 3,700,000.

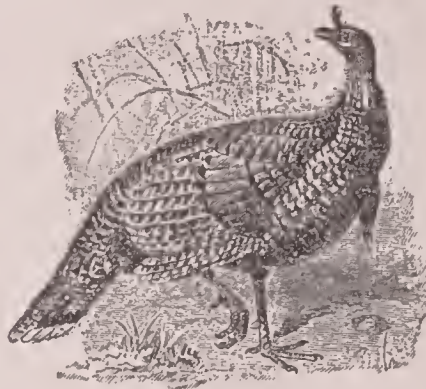
TURKEY, a Mohammedan state of Southeastern Europe and Western Asia, under the rule of a sultan. In Europe it occupies a considerable portion of the Balkan peninsula, and in this portion is situated the capital, Constantinople, but the larger part of Turkey is in Asia. The immediate possessions of Turkey in Europe, or those directly under the sultan's rule, extend from Montenegro, Bosnia, Servia, and Eastern Roumelia on the north to the Ægean Sea and Greece on the south, and from the Black sea to the Adriatic, the Straits of Otranto and the Ionic sea. The Treaty of Berlin in 1878 greatly reduced the area under direct Turkish rule, besides confirming the independence and extending the limits of several of the formerly tributary states. There are still nominally under Turkey the tributary principality of Bulgaria, to which has been united Eastern Roumelia; and the semi-detached provinces of Bosnia, Herzegovina, and Novibazar, administered by Austria-Hungary. The immediate possessions in Europe have an area of 63,850 sq. miles, pop. 5,711,000; in Asia, 729,170 sq. miles, pop. 16,823,500; in Africa (Tripoli), 398,873 sq. miles, pop. 1,000,000. Total, 1,191,893 sq. miles; pop. 23,534,500. A number of islands in the Ægean, the largest being Crete or

Candia, belong to Turkey. Egypt also is nominally part of the Turkish dominions. European Turkey is traversed in different directions by numerous mountain chains, but the main systems are the Balkan range, stretching from west to east between Bulgaria and Eastern Roumelia to Cape Emineh on the Black sea; Rhodope, south of the Balkans, the Shardagh and Grammos on the west; continued northwestward under various names into Bosnia and Herzegovina. The most important river basin is that which drains into the Archipelago or Ægean sea, which receives the Vardar, the Struma, the Mista or Karasu, and the Maritza. The Adriatic and Ionian seas receive from Turkey no rivers worthy of notice, and the Sea of Marmora receives only a few mountain torrents. There are several plains remarkable for their fertility and beauty. The climate is not so mild as its latitude might seem to indicate, the winter being severe; but the summer heat is excessive. For the production of the ordinary cereals no part of the world is more admirably adapted. The principal grains are corn, wheat, and barley, while rice, millet, and buckwheat are produced, as also flax, hemp, sesame, and madder. The cultivation of tobacco and cotton is very general. Among fruits the figs are highly esteemed; the cultivation of the olive is carried on along the coasts of the Archipelago and the Adriatic; wine is an important product in many districts; and much attention is paid in some parts to the growing of roses (for otto or attar). There are few manufactures except in Constantinople, Adrianople, and Salonica, and these are of little importance. Turkey in Asia comprises the peninsula of Asia Minor, the country intersected by the Euphrates and the Tigris, the mountainous region of Armenia between their upper courses and the Black sea, the ancient lands of Syria and Palestine, and the coast strips of Arabia along the Red sea and Persian gulf. Omitting Arabia, the country consists mainly of (1) a high plateau traversed by the mountains of Taurus and Anti-Taurus, and stretching from the Archipelago to the borders of Persia; (2) a plateau of less elevation and extent (Syria and Palestine) traversed by the double range of Lebanon; and (3) the extensive plain of Mesopotamia on the Lower Tigris and Euphrates. (See Asia Minor, Armenia, Kurdistan, Mesopotamia, Syria, and Palestine.) The islands Chios, Lesbos, Rhodes, etc., belong to Turkey in Asia, while the island of Samos is a tributary principality, and Cyprus is held by Britain. The chief towns in Asiatic Turkey are Smyrna, Damascus, Bagdad, Aleppo, and Beyrout. The chief exports are raisins, figs, and dates, silk, cotton, wool, and mohair, opium, coffee, wheat, wine, valonia, olive-oil, and tobacco; while the imports are cotton, woolen, and silk goods, metals, iron, steel, glass wares, etc. The inhabitants of the Ottoman empire are of very diverse races. First in order are the Osmanli Turks, who, as the dominant race, are diffused over the country. They are proprietors of the greater part of the soil, fill all the civil and military

offices, live generally in towns employed in various trades, and are seldom agriculturists. The Greeks form the bulk of the population over great part of the Ægean coasts and islands, and constitute to a very considerable extent the mercantile and trading community of Turkey. Arnauts, or Albanians, are found in the west throughout Albania; the northwest is occupied by Servians; and Bulgarians inhabit the district south of the Danube and east of Servia and Albania. In Asiatic Turkey the Turks are an important element, but there are also numbers of Armenians, Arabs, Kurds, Jews, Greeks, Circassians, etc. The Turkish language belongs to the Turanian family of languages, and is allied to the Hungarian and the Finnish. The government of Turkey was despotic until 1908 when the movement known as Young Turkey extorted a Constitution and a Parliament from Abdul Hamid. The Cabinet now rules. The Monarch, usually designated the Sultan, is regarded by the Turks as the caliph or head of Islam. His edicts bear the name of Hatti-sherif, and his government is often designated as the Sublime Porte. The public officers who conduct the administration under the sultan are divided into three classes. The first class is that of law and religion, and at their head is the Sheik-ul-Islam, who governs a judicial and ecclesiastical body called the Ulemas. The second class consists of the "officials of the pen," or the members of administration, and at their head is the grand vizier or Sadrazam. The third class includes the "officials of the Sword," at their head being the Seraskier or minister of war, and the Capudan Pasha or minister of marine. The army on a war footing is said to number about 700,000, and it is believed that when the new system recently begun is complete, Turkey will have an army and reserve of 1,000,000 men. The navy numbers only a very few vessels of much fighting power, others being old and small. The financial condition of Turkey is thoroughly unsound. From 1854 the state had contracted a series of foreign loans, the total nominal capital of which amounted to about \$1,140,000,000 in 1877. In 1875 the government announced that they would pay half the interest on the debt, but in 1876 they declared themselves unable to pay anything. In 1881 an arrangement was effected by delegates of the bondholders who met at Constantinople. The Turkish government then agreed to hand over the excise and other revenue to a commission representing the bondholders, so that interest to the extent of 1 per cent has been paid since 1882. Other debts have since been incurred, and the total is now \$900,000,000, besides internal and floating debt. The established religion is Mohammedanism, but Christianity under the Greek form is professed by a large majority of the Greeks and Bulgarians, while part of the Albanians are Roman Catholics. The educational system in accordance with the law of 1869, provides for the erection of elementary schools in every commune, and of secondary schools in the

larger towns, while at Constantinople in 1870 a university was opened. There are besides law, military, and medical schools in that city. History.—See Ottoman Empire.

TURKEY, a large gallinaceous bird, well known as an inmate of our poultry-yards. It is a native of North America, and was introduced into Europe in the 16th century. Wild turkeys abound in some of the forests of America, where they feed on berries, fruits, insects, reptiles, etc., their plumage being a golden bronze, shot with violet and green, and banded with black. On ac-



Wild turkey of the United States.

count of its size and the excellence of its flesh and eggs, the turkey is one of the most valued kinds of poultry. There is another species, the Honduras or West Indian turkey, which derives its specific name from the presence of bright eye-like spots on the tail-coverts. It is not so large as the common turkey, but its plumage is more brilliant.

TURKEY-BUZZARD, or **TURKEY-VULTURE**, a rapacious bird belonging to the vulture family, so named from its bearing a distant resemblance to a turkey. It is about 2½ feet long, and with wings extended about 6 feet in breadth, general color black or brownish. It inhabits a vast range of territory in the warmer parts of America.

TURKOMANS, a nomadic Tartar people occupying a territory stretching between the Caspian sea and the Sea of Aral, the khanates of Khiva and Bokhara, Afghanistan, and Persia. They do not form a single nation, but are divided into numerous tribes or clans.

TURKS, a widely spread race, supposed to have had its original seat in Turkestan, but now extending from European Turkey through Asia to the shores of the Northern ocean. Besides the Ottoman Turks or Osmanli of Turkey, the Turkomans, Kirghiz, Usbecks, Yakuts, etc., all belong to the Turkish race.

TURMERIC, the dried tubers or rhizomes of ginger. It is largely employed in India and China as an important ingredient in curry powder. Unsized white paper, steeped in an alcoholic solution of turmeric, when dried, is employed as a test to detect alkalies, which change its color from yellow to reddish-brown. Turmeric yields a yellow color, which has great brightness but little durability. It is also used medicinally in the East as a carminative.

TURNER, Joseph Mallord William,

R. A., great English landscape-painter, was born in London 1775, died 1851. He was elected in 1799 an associate of the Royal Academy. In the two following years he exhibited fourteen pictures, and in 1802 was elected an academician. In 1807 he was elected professor of perspective in the Royal academy, and the following year appeared his *Liber Studiorum* or Book of Studies, which Charles Turner, Mr. Lupton, and others engraved. Other works by him which were engraved are his illustrations of Lord Byron's and Sir Walter Scott's poems; Roger's Italy and Poems; The Rivers of England; the Rivers of France, and Scenery of the Southern Coast. The reputation of Turner, among landscape painters stands alone, solitary, colossal; no man has displayed at the same time such great powers of generalizing and concentrating the beauties of nature. For half a century Turner produced a succession of great works, from 1790 to 1840. By his will he bequeathed all his pictures and sketches to the nation, on condition of a suitable building being erected within ten years for their reception. They have been placed in the Turner gallery, occupying two rooms in the National gallery.

TURNIP, the common name of a cruciferous, biennial plant, much cultivated on account of its esculent root, and of the same genus as the cabbage cauliflower, and broccoli. The root is generally used as a culinary vegetable in all temperate climates, and is cultivated on a large scale for feeding stock, the root being invaluable for this purpose. In the field culture of the larger-rooted varieties the most advantageous mode is by drills. The roots of the turnip have often a tendency to divide and become hard and worthless—a condition known as finger-and-toe, or dactylorhiza. The plant thrives best on a rich and free soil and in moist cloudy weather. There are several varieties, all apparently the result of cultivation.

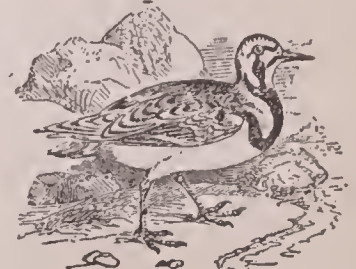
TURNIP-FLY, Turnip-flea, a small insect, very destructive to young turnips. It may be recognized by two yel-



Striped turnip-fly. aa, Natural size. bb, Magnified. c, Larva, natural size.

low stripes on its wing-cases. The larvæ of this fly, popularly known as niggers, are very destructive to the leaves of the turnip.

TURNSTONE, a grallatorial bird of



Turnstone.

the plover family. The length of the bird is about 9 inches. It takes its name

from its practice of turning up small stones in search of the marine worms, minute crustaceans, etc., on which it feeds. It appears in most parts of the globe.

TURN-TABLE, in railways, a circular platform of iron and wood, supported on rollers, and turning upon a center without much friction, even when loaded with a considerable weight. It is used for removing single carriages from one line of rails to another, and also for reversing engines on the same line of rails.

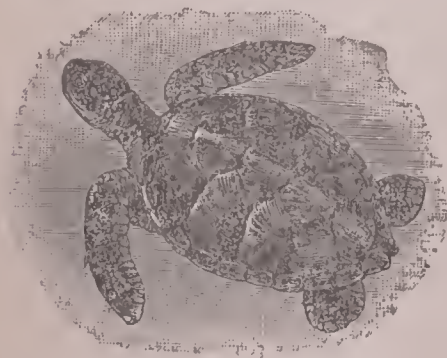
TURPENTINE, an oleo-resinous substance flowing naturally or by incision from several species of trees, as from the pine, larch, fir, pistacia, etc. Common turpentine is obtained from the Scotch fir, and some other species of pines. Venice turpentine is yielded by the larch, Strasburg turpentine by the silver fir; Bordeaux turpentine by the maritime pine; Canadian turpentine, or Canada balsam by the balm of Gilead fir. All the turpentines dissolve in pure alcohol, and by distillation yield oils, which are termed spirits of turpentine. Oil or spirits of turpentine is used in medicine externally as an excellent rubefacient and counter-irritant, and internally as a vermifuge, stimulant, and diuretic. It is also much used in the arts for dissolving resins and oils in making varnishes, and is familiarly called turps.

TURQUOISE (tur'kis), a greenish-blue opaque precious stone, consisting essentially of a phosphate of alumina, containing a little oxide of iron and oxide of copper. The true or oriental turquoise, a favorite ornamental stone in rings and other articles of jewelry, is only found in a mountain region of Persia.

TURRET, in architecture, a kind of small tower. Turrets are chiefly of two kinds, such as rise immediately from the ground, as staircase turrets, and such as are formed on the upper part of a building by being carried up higher than the rest.

TURRET-SHIP. See Ironclad Vessels.

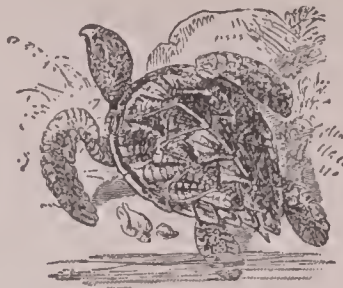
TURTLE, the name given to the marine members of the order Chelonia, being reptiles which differ but little from tortoises, the name turtle or tortoise being in some cases applied indifferently.



Green turtle.

They are found in all the seas of warm climates, and feed mostly on marine plants. The most important species is the green turtle which is from 6 to 7 feet long, and weighs from 700 to 800 pounds. Its flesh is highly esteemed as a table

luxury. It is a native of the tropical parts of the Atlantic as well as of the Indian ocean, being especially abundant near Ascension island. The logger-head turtle yields an oil, which is used for



Hawk's-bill or tortoise-shell turtle.

lamps and for dressing leather. The hawk's-bill turtle is remarkable for the beautiful imbricated horny plates covering the carapace, and constituting the tortoise-shell of commerce.

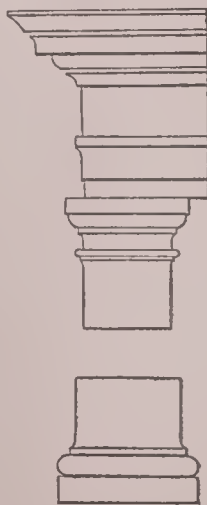
TURTLE-DOVE, a small variety of pigeon, about 11 inches in length, color pale brown marked with a darker hue above, a purple tinge pervading the



Turtle-dove.

feathers of the breast. They are in general smaller and more slender than the domesticated pigeons, and their cooing is plaintive and tender.

TUSCAN ORDER OF ARCHITECTURE, one of the five orders of archi-



Tuscan order.

ecture. It admits of no ornaments, and the columns are never fluted. Otherwise it differs so little, however, from the

Doric, that it is generally regarded as being only a variety of the latter.

TUSCANY, formerly a grand-duchy, now a department of Italy; area, 9289 sq. miles; pop. 2,548,154. The chain of the Northern Apennines forms a considerable portion of its northern boundary, the sea being its boundary on the west. The principal river is the Arno. Cereals cover a large area, and vineyards, olive-yards, and orchards are numerous. The manufacture of silk is considerable. The marble of Tuscany, especially that of Siena is well known.

TVER, a town, Russia, capital of the government of the same name, situated in a plain on the Volga, 96 miles northwest of Moscow. It consists of the Kremlin or fortress, surrounded by an earthen wall, and the town proper. The manufactures are numerous and varied. Pop. 53,477.—The government of Tver has an area of 25,225 sq. miles, and a population of 1,681,790. Rye, barley, hemp, and flax are largely cultivated, and the forests are extensive.

TWAIN, Mark. See Clemens.

TWEED, a river of Scotland, which rises in the south part of Peeblesshire; it forms the boundary line between England and Scotland for 16 miles, runs through England for a short distance, and then enters the North sea at Berwick; total length, 97 miles.

TWEED, William Marcy, American politician, was born in New York City in 1823. He entered politics early becoming an alderman of New York City, and taking a seat in congress in 1853. Subsequently he was a school commissioner; became a member of the board of supervisors of New York county, and was president of the board for four successive terms. From 1867 to 1871 he was a state senator. A member of the Tammany society for many years, he was grand sashem in 1869-71. When commissioner of public works he organized the combination known as the "Tammany Ring," or the "Tweed Ring." The "ring," elected its candidate for mayor in 1865, and its candidate for governor in 1868. Legislators and judges were bribed, and bills were passed and decisions rendered in favor of the members of the "ring." Fraudulent bills were audited, and their sum divided among the thieves, etc. A vigorous investigation and prosecution was undertaken under the lead of Samuel J. Tilden. In 1873 Tweed was convicted, and sentenced to twelve years' confinement in the penitentiary, and to pay a fine of \$12,300.18. He was released in 1875 by a decision of the court of appeals, on a legal technicality. He was immediately rearrested but being permitted to go out to drive with an officer, he made his escape, and fled to Spain. He was returned in November, 1876, and again incarcerated in Ludlow Street jail until April 12, 1878, when he died.

TWELFTH-DAY, the twelfth day after Christmas, upon which is held the festival of Epiphany. On the evening of this day, called Twelfth-night, various social rites and ceremonies are observed in different countries. One of these is the baking of a twelfth-cake, into which a bean is introduced. When the cake is

divided at the feast the person who receives the piece containing the bean is made king for the occasion.

TWILIGHT, daylight which continues after sunset, occasioned by the reflection of sunlight from the higher parts of the atmosphere which are still illuminated after the sun has become invisible from ordinary heights. It is supposed to last till the sun is about 18° below the horizon, but is much influenced by the state of the atmosphere as to clouds, etc. In low latitudes (that is, near the equator), there is little twilight.

TWILL, a textile fabric, in which the weft threads do not pass over and under the warp-threads in regular succession, as in common plain weaving, but pass over one and under two, over one and under three, or over one and under eight or ten, according to the kind of twill.

TYLER, John, tenth president of the United States, born 1790, died 1862. He entered congress as a republican in 1816, and in 1840 was vice-president under the presidency of General Harrison. On Harrison's death in 1841 he became president, and came into collision with his party on the National Bank bill and other questions. The annexation of Texas was the chief event of his term of office, at the end of which he retired into private life. On the outbreak of the secession war he espoused the cause of the south, and was a member of the confederate congress.

TYMPANUM, (1) a cavity of an irregular shape situated in the ear. (See Ear.) (2) In architecture, the triangular space in a pediment included between the cornices of the inclined sides and the



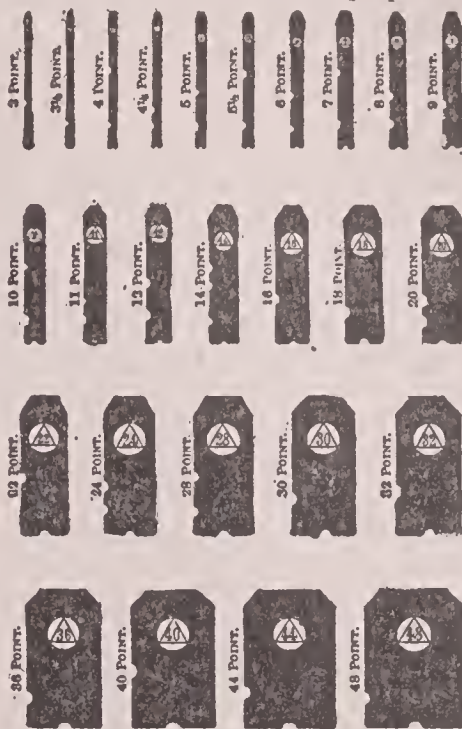
Tympanum of the south portal of the Abbey Church of St. Denis, France.

horizontal cornice; also, any similar space, as above a window, or the space included between the lintel of a door and the arch above it. The tympanum is often ornamented with carving or sculpture.

TYNDALL, John, physicist, born in 1820 at Leighlin Bridge, Carlow, Ireland; was elected to the chair of natural philosophy in the Royal institution in 1853; visited Switzerland in 1856 along with Huxley, and made repeated investigations in that country subsequently; lectured throughout the United States in 1872; presided over the British association in 1874 at Belfast. He died in 1893. His chief works are: *The Glaciers of the Alps*, *Mountaineering in 1861*, *Heat Considered as a Mode of Motion*, *On Radiation*, *Sound*, *Faraday as a Discoverer*, *Light*, *The Forms of Water in Clouds*, *Rivers*, *Ice*, and *Glaciers*, *Fragments of Science*, *Floating Matter*

in the Air in Relation to Putrefaction and Infection.

TYPE. Types from which books and newspapers are printed are cast by machinery from an alloy of lead, tin, and antimony, the lead being the chief constituent of the type-metal. Antimony is added to supply the necessary hardness, while the tin serves to fuse the lead and antimony, to toughen the alloy, and to prevent oxidation. Some foundries add a small proportion



Sizes of type made on the point system (reduced one-third).

of copper to give still greater tenacity, while others add a copper face to the letter.

To produce a font or series of type, six mechanical operations are necessary—i.e., (1) punch cutting, or the designing and engraving the model characters from which the types are made; (2) fitting up, or adjusting the matrices; (3) making the matrices; (4) making the molds in which the types are cast; (5) casting the types; (6) finishing. Formerly all types were cast by hand, a slow and laborious process. A skilled workman at best could produce from 2000 to 3000 types a day. Since 1838 types have been cast by machinery.

The "face" of a type is the letter or character from which the printed impression is made. The word "face" also is used to distinguish one style of type from another. The "beard" or "neck" is the slope between the outer edge of the face and the shoulder. The "shoulder" is the flat top of the body which upholds the neck and face of the type. The "counter" is the depression between the lines of the face. The "stem" is the thick line of the letter. The "serif" is the short cross-line put as a finish at the ends of unconnected lines. The "hair line" is the thin line of the face.

Types necessarily are of varied sizes and designs. Up to within recent years there was little attempt to secure uniformity in sizes. The types of some

founders would not "justify" or "line" with the types of others. But the system of classification of sizes had been reduced to a general scheme, the sizes being designated as follows: Brilliant, diamond, pearl, agate, nonpareil, minion, brevier, bourgeois, long primer, small pica, pica, English, great primer, double small pica, double pica, double English, double great primer, double paragon, canon.

Since 1886 practically all type cast by American foundries has been cast on the "point" system, and eventually the system will be adopted by foreign makers of type. Before that year the standard of size varied, and there was endless confusion and loss of time and money. To obviate this confusion the American type-foundries in 1886 adopted the "pica" as the basis of a new system of measurements. The pica was divided into twelve equal parts, and, accepting one of these twelve parts as its unit, a base was made for the determination of the size of every body of type. This twelfth part of a pica was called a "point." All type bodies were cast on multiples of this point, and called by numerical names. Thus pica became "12-point"; double pica, "24-point," etc. Nonpareil, or half of pica, became "6-point"; agate, "5-point"; brevier, "8-point," etc. The point system was also adopted to all leads, rules, and spaces used in the printing of books.

Under the American system of points the bodies of type are clearly described by numerical names. The faces and styles have to be described by names, many of them fanciful and few of them actually descriptive. There are, however, a number of recognized standard styles of type, as follows:

Scripts are imitations of different styles of handwriting.

Italic is a simplified style of script, the letters being disconnected.

Black letter is a degenerate form of roman, in which angles are substituted for curves.

Gothics, the simplest and rudest of all styles, are cast without serifs.

Italian is a roman in which the position of hair line and thick stroke have been transposed.

Antique is a roman in which the lines of all the characters are nearly uniform as to thickness.

Roman is the type universally used in books and newspapers.

Old style is the roman type of earlier decades. The hair lines are firmer, although shorter than in the modern cut faces; the serifs at the font are shorter, and it is not angled. Old style is used in book work, seldom in newspapers.

TYPECASTING MACHINES. Types from which books and newspapers are printed are cast by machines, of which a number are in general use. Up to 1838, however, all type was cast by hand, a slow and laborious process. A skilled workman could turn out from 2000 to 3000 types a day, many of them so imperfect that they had to be rejected. In 1838 David Bruce, Jr., of New York, invented a practical type-casting machine which was used for forty years almost without a rival. Yet it never was regarded as a perfect ma-

chine. It did not cast a finished type. Exact type had to be finished and dressed by hand. In 1888 Henry Barth produced a machine which practically superseded the Bruce machine, for it cast and finished type at the rate of 1000 an hour. The Barth machine was adopted by the leading type-foundries of the United States and England. In 1905 the Sennett Automatic Caster was invented and placed on the market by Sylvester Sennett, of Chicago. It is a marvelous machine, simple in its parts, and casts 7500 types an hour, ready for the printer's use. A machine known as a "sort caster," adapted for supplying smaller offices with "sorts" as needed, was invented in 1899 by Frank Brown, G. A. Boyden, and John E. Hanrahan, of Boston.

TYPESETTING MACHINES, the perfection of the typesetting machine has revolutionized the printing of newspapers and books. Since 1885 American inventors have supplied the world with typesetting machinery. Every style of machine in commercial operation in any part of the world is of American invention. The Linotype, Monotype, Monoline, Typograph and Simplex machines are in general use in all quarters of the globe. Machines of European invention are in limited use only in their own countries. The typesetting machines in general use in the United States are the Linotype and the Monotype—the former being the favorite in newspaper offices and the latter being better adapted for book and tabular work. The Linotype, as its name implies, casts an entire line while the Monotype casts each letter separately. The Monoline, another slug casting machine, conflicts with the Linotype patents and therefore is barred from the United States. It is in daily use in Canada and Germany. The Graphotype, invented by George A. Goodson of Minneapolis, Minn., is a type caster worked by electrically controlled devices, its product being similar to that of the Monotype. The Linotype is the product of the genius of Ottmar Mergenthaler. After working for seven years in trying to make a practical machine for setting up individual type Mergenthaler in 1884 conceived the idea of assembling a line of dies or female matrices and casting them into molten metal to form a slug which would itself be a complete line of type. He succeeded and in 1885 built the first Linotype. The first Linotype, however, would not be recognized in the Linotype of to-day. The matrix channels were upright tubes, an air blast was required to blow the matrices into an assembler and electricity was employed in its operation. These objectionable features were eliminated in a new Linotype put on the market in 1890, known as the square base Linotype. Mergenthaler did not live to reap the fruits of his genius, dying in 1899. The latest Linotype permits any size of type from 5 to 14 point to be composed in any length of line from 5 to 30 ems pica. Fifteen different languages are now set on the Linotype in as many different countries. The Lanston Monotype Machine casts separately each letter, point, and sign, including the spaces. The machine

comprises a keyboard and a type-casting machine. The keyboard punches a series of holes made by the operator striking the keys on the keyboard in a moving strip of paper, which is unwound from one spool to another, passing under a series of punches in its journey. The result of the keyboard operation is, therefore, a roll of perforated paper. This paper when fed to the casting machine, initiates and controls all the operations which produce the cast type set in column width ready to take printed proofs from.

TYPEWRITER, a machine intended to be used as a substitute for the pen, and by which the letters are produced by the impression of inked types. The essential elements in such machines are a movement to bring the type into position, an inking device, an impression movement, and means for letter and line spacing. A successful form of the machine has a series of letter keys arranged in rows, to be worked by the fingers of both hands, a letter being imprinted on the paper (which moves automatically) each time a key is struck. In recent years several typewriters have been brought before the public, such as the Remington, Hammond, Smith-Premier, Bar-Lock, Oliver, etc., and improvements are made from time to time. Typewriters for printing in books have also proved very successful. The growth of the use of the typewriter has been rapid. It was placed on the market in the early seventies and was soon appreciated. The twelfth census contains an account of the comparative speed of typesetting and hand labor. "In this instance the unit required was the copying of 1000 words of statute law; this was accomplished by the typewriter in 19.5 minutes, or at the rate of 51 words per minute while a copyist with a pen required 1 hour and 14.8 minutes, or about four times as long. Typewriters are now an essential part of the equipment of business offices and are used extensively in railroad, telegraph and newspaper offices. The enormous growth of the industry is shown by the fact that the number of factories engaged in making them has increased 60 per cent, the capital invested 500 per cent, and the value of the product over 100 per cent since 1890.

TYPHOID FEVER, called also enteric fever and gastric fever, a disease somewhat resembling typhus, but essentially different. It is characterized by serious disorder of the bowels, and is not infectious in the sense that it can be communicated from one person to another by breath or by the skin, as in scarlet fever and small-pox. The poison seems to consist of living organisms or disease germs which exist in the discharges from typhoid fever patients, may gain admission to the water of wells, and hence to the human stomach, perhaps by the water being used to wash milk dishes. When these germs gain access to the alimentary canal of a person whose general health is impaired, the disease is usually set up. It is uncertain what time may elapse between the introduction of the poison and the appearance of the disease, but the period is usually about three weeks. The symp-

toms of the disease are languor, chills, violent headache, thirst, and pains in the limbs. Soon diarrhoea sets in, accompanied by a distended and tender state of the abdomen. The temperature rises, the skin loses its moisture, the kidneys cease to act freely, and the tongue becomes dry and brown. Then a rose-colored rash appears over the chest and abdomen, which may soon disappear, only, however, to be followed by a new crop of spots. At this stage delirium and other serious symptoms arise, and as the disease advances ulceration or perforation of the bowels may take place. While the symptoms here described are those of a typical case, there are numerous instances where the patient may have no marked looseness of the bowels, no spots on the skin, and no delirium. In the treatment of the disease the most important thing is the dieting. Only soft liquid foods are allowable, such as milk, in abundance, boiled milk and bread, corn-flour, etc. Looseness of the bowels, if excessive, should be checked by catechu and chalk mixture, with the addition of laudanum, if necessary, to a grown-up person. The disease, even in a mild form, is sufficiently serious, and it often proves fatal.

TYPHOON, a violent hurricane, especially one of those which rage on the coasts of China and Japan and the neighboring archipelago, occurring from May to November, being most frequent and disastrous in July, August, and September.

TYPHUS FEVER, known also as hospital fever, jail fever, etc., is essentially a fever of the poor, ill-fed, and badly-housed inhabitants of large cities. It is infectious, and the infection seems to be carried in the breath of the patient. For this reason free ventilation is the least favorable condition for the spread of typhus. Before the symptoms show themselves a period of from five to twelve days may pass after the person is infected. Then there is generally a shivering, followed by a hot, dry skin, a suffused condition of the eyes, a small pupil, thirst, a dull, stupid expression, great prostration, and costive bowels. About the seventh day a rash of irregular spots and of a dusky hue appears over the chest and back, but sometimes this is entirely absent. As the disease advances the patient's strength becomes exhausted, the urinary secretion is scanty, if not entirely suppressed, delirium sets in, and the disease is often complicated by bronchitis, pneumonia, or pleurisy. About the fourteenth day, in favorable cases, the turn of the fever is shown by the patient falling into a sound sleep, from which he wakes with the fever gone. In unfavorable cases the prostration increases, the feverishness is heightened, convulsions may occur, and at length the patient sinks into unconsciousness. The treatment consists in keeping the patient in a well-ventilated room, and preventing exhaustion by a light and wholesome diet. Milk, beef-tea, nourishing soups without vegetables, should be given to the patient in small quantities at short intervals.

TYPOGRAPHY. See Printing.

TYRE, one of the most celebrated

cities of ancient Phœnicia, and with its elder sister, Sidon, long a great trading mart. It was built partly on an island and partly on the mainland; and the insular fortifications formed its chief strength when besieged and taken by Alexander the Great in B.C. 332. A mole or causeway then constructed to the island was the origin of the isthmus which now connects it with the mainland. Tyre was famous in the 10th century B.C. under Hiram the friend of

Solomon, was besieged in vain by the Assyrians in 725-720 B.C., and by Nebuchadnezzar 585-572 B.C., and remained an important place till it came into the hands of the Turks. The modern Tyre or Sur is an insignificant place of 5000 inhabitants.

TYROL' or **TIROL'**, a province of Austria (including Tyrol proper and Vorarlberg), is bounded north by Bavaria and Lake Constance, west by Switzerland, east by Salzburg and

Illyria, south, east, and west by Venetia and Lombardy; area, 11,325 sq. miles. In magnificence of scenery Tyrol is only inferior to Switzerland, of which it is a continuation. The capital is Innsbruck. Pop. 850,062.

TYRONE, a county of Ireland, in the province of Ulster; bounded by Londonderry, Donegal, Armagh, Monaghan, and Fermanagh; area, 778,943 acres. Pop. 150,468.

U

U, the twenty-first letter and the fifth vowel in the English alphabet. Its true primary sound was that which it still retains, that of oo in cool, tool, good, wood, etc., answering to the French ou in tour, the sound being sometimes short, sometimes long.

UDAIPUR, or **OODEYPORE**, a town in the northwest of India, capital of a native state of the same name in Rajputana, Pop. 45,976.—The state (called also Meywar), area 12,670 sq. miles, came under the protection of Britain in 1817, and the rajah ranks highest in dignity among the Rajput chiefs. Pop. 1,728,049.

UNDINE (ō'di-nā), a walled town of North Italy, capital of a province of same name and see of an archbishop, 60 miles northeast of Venice. Pop. 37,933; of prov. 594,334.

UFA, a government of Russia, separated in 1865 from Orenburg; area, 47,112 sq. miles. Pop. 2,220,497.—Ufa, the capital, stands on the Bielaya, at the confluence of the Ufa, 735 miles east by north of Moscow. It is the see of a bishop, and has considerable manufactures and trade. Pop. 49,961.

UGANDA, a country of British East Africa, to the n. w. of the Victoria Nyanza. It is a rich agricultural country with a mild and uniform climate, and the inhabitants are of a comparatively high type. It was first visited by Speke and Grant in 1860, and is the seat of several mission stations. The population is estimated at 5,000,000.

UHLANS (ō'lānz), a species of light cavalry in the armies of the Austrians, Russians, and Germans.

UINTAH (or Uinta) **MOUNTAINS**, a range of lofty mountains in Utah, United States, which extend e. from the Wahsatch range, and occupy a large area. Some of the peaks reach an altitude of over 13,000 feet.

U'KASE, a Russian edict or order, legislative or administrative, emanating from the government. Ukases have the force of laws till they are annulled by subsequent decisions.

UKRAINE, an extensive country formerly on the frontier between Poland and Russia, now forming the Russian governments of Kief, Chernigof, Podolsk, Kharkof and Poltava.

ULCER, a sore in any of the soft parts of the body, either open to the surface or to some natural cavity, and attended with a secretion of pus or some kind of discharge. Ulcers are of various kinds, as scorbutic, cancerous, scrofulous, etc.

ULSTER, the most northerly of the

four provinces of Ireland, comprehending the counties of Antrim, Armagh, Cavan, Donegal, Down, Fermanagh, Londonderry, Monaghan, and Tyrone. Area, 5,483,201 acres, or 8568 sq. miles. Pop. 1,581,351.

ULTRAMARINE', a beautiful and durable sky-blue pigment, a color formed of the mineral called lapis lazuli. This substance is much valued by painters, on account of the beauty and permanence of its color, both for oil and water painting. Artificial ultramarine is prepared by heating sulphide of sodium with a mixture of silicic acid and alumina.

UTRAMONTANISM, the views of that party in the Church of Rome, who place an absolute authority in matters of faith and discipline in the hands of the pope, in opposition to the views of the party who would place the national churches, such as the Gallican, in partial independence of the Roman curia, and make the pope subordinate to the statutes of an œcumenical council. According to ultramontanism the pope is superior to general councils, independent of their decrees, and considered to be the source of all jurisdiction in the church. The Vatican council of 1870 virtually established the views of ultramontanism as dogmas of the church.

ULYSSES (ū-lis'sēz), king of the island of Ithaca, was one of the Greek heroes who engaged in the war against Troy. In returning to his own country after the siege he visited the country of the Lotophagi in North Africa, the Cyclopes in Sicily (see Polyphemus), the island of Æolus king of the winds, reached the island Ææa, where Circe changed (temporarily) his companions into pigs, visited the infernal regions, where he consulted the soothsayer Tiresias how to return to his country; passed in safety the coast of the Sirens, and the dangers of Scylla and Charybdis; remained for seven years with the nymph Calypso after losing all his men; and at last, after an absence of twenty years returned to Ithaca. Here he found his palace occupied and his substance wasted by suitors for the hand of his wife Penelope, but with the aid of his son Telemachus he put them to death. He lived about sixteen years after his return. These adventures of Ulysses are the subject of Homer's Odyssey.

UMBEL, in botany, a variety of inflorescence which consists of a number of pedicels or flower-stalks, nearly equal in length, springing from a common center, with the blossoms on their sum-

mits forming a level or rounded surface. When a number of such umbels are aggregated together in the same way



Umbels of hemlock.

we have a compound umbel, the smaller umbels being called partial umbels.

UMBELLIFERÆ, an extensive and important natural order of plants, the flowers of which are almost always in regular compound umbels. The plants of this order are natives chiefly of the northern parts of the northern hemisphere, and nearly all herbs with fistular furrowed stems and divided leaves; the fruit consists of two indehiscent ridged carpels united by a commissure. Some are very poisonous, as hemlock, and certain others; others are esculent, as celery, carrots, and parsnips; many yield aromatics, as caraway, coriander, dill, anise; a few secrete a foetid gumm-resin, much used in medicine, as asa-fetida, galbanum, opopanax, and sagapenum.

UMBER, a well-known mineral pigment, of an olive-brown color in its raw state, but much redder when burnt. It occurs either naturally in veins and beds, or is prepared artificially from various admixtures. The commercial varieties are known as Turkey umber, raw and burnt, and English umber, the latter being an artificial ochrey admixture.

UMBRA, in astronomy, a term applied to the total shadow of the earth or moon in an eclipse, or to the dark cone projected from a planet or satellite on the side opposite to the sun. See Penumbra, Eclipse.

UMBRELLA, a portable shade, screen, or canopy which opens and folds, carried in the hand for sheltering the person. The umbrella had its origin in the East in very remote times, where it was (and still is) regarded as an emblem of royalty or a mark of distinction; but as a de-

UMBRELLA BIRD

fense from rain it was not used in England till early in the 18th century.

UMBRELLA-BIRD, a South American bird allied to the crows, remarkable for the crest of blue-black feathers rising from the head and curving toward the



Umbrella-bird.

end of the beak, which it nearly reaches. Another long tuft of feathers hang down from the breast.

UMBRIA, a division of Italy, on the Adriatic, which derives its appellation from the Umbrians, by whom it was inhabited in ancient times. It now forms the province of Perugia. The Umbrians were an ancient Italic people speaking a language akin to the Latin.

UNCONFORMABLE, in geology, a term applied to strata whose planes do



Unconformable strata.

not lie parallel with those of the subjacent or superjacent strata but have a different line of direction or inclination.

UNCTION, Extreme. See Extreme Unction.

UNDERSHOT-WHEEL, a form of water-wheel having a number of float-boards disposed on its circumference, and turned round by the moving force of a stream of water acting on the float-boards at its lowest part. In this wheel the water acts entirely by its momentum.

UN'DINE, a water-spirit of the female sex, resembling in character the sylphs or spirits of the air, and corresponding somewhat to the naiads of classical mythology. According to Paracelsus, when an undine married a mortal and bore a child she received a soul. One of these spirits is the heroine of a celebrated romance by De la Motte Fouqué.

UNDULATORY THEORY, in physics, the theory which regards light as a mode of motion generated by molecular vibrations in the luminous source, and propagated by undulations in the subtle me-

dium known as the ether, presumed to pervade all space and to occupy the intervals which separate the molecules or atoms of bodies. When these undulations reach and act on the nerves of our retina they produce in us the sensation of light. The only other theory of light which can be opposed to this, and which is variously called the corpuscular, emission, or material theory, supposes light to consist of material particles, emitted from the source, and projected in straight lines in all directions with a velocity which continues uniform at all distances, and is the same for all intensities. The undulatory theory, is however, now generally adopted by physicists.

UNGULA'TA, the ungulate or hoofed quadrupeds, forming the largest and most important order of the mammalia. This order is subdivided into (a) the section Perissodactyla, or odd-toed ungulates, which includes the rhinoceros, the tapirs, the horse and all its allies; and (b) the Artiodactyla, or even-toed, which comprises the hippopotamus, the pigs, and the whole group of ruminants, including oxen, sheep, goats, antelopes, camels, deer, etc., In the former section the hind feet are odd-toed (one or three toes) in all the members, and the fore-foot in all except the tapirs; in the latter section the toes are always even in number, either two or four.

UNICORN, a fabulous animal represented as with one horn growing from its forehead. Such an animal is frequently mentioned by Greek and Roman writers, who generally described it as a native of India, of the size and form of a horse, the body being white, and a straight horn growing from its forehead. The reem of the Hebrews, of which unicorn is a mistranslation (Deut. xxxiii. 17, and elsewhere), was probably a urus. It was a two-horned animal. The unicorn is one of the supporters of the royal arms of Great Britain, in that posture termed salient. It was taken from the arms of Scotland, which had two unicorns as supporters.

UNICORN-ROOT, a popular name of the plant a native of North America, which furnishes one of the most intense bitters known, used as a tonic and stomachic.

UNIT, in arithmetic, the least whole number, or one, represented by the figure 1. Every other number is an assemblage of units. This definition is applicable to fractions as well as to whole numbers. In mathematics and physics a unit is any known determinate quantity by the constant repetition of which any other quality of the same kind is measured. It is not itself one, but is a length, or a surface, or a solid, or a weight, or a time, as the case may be, while 1 is only a numerical symbol.—Specific gravity unit: for solids or liquids, 1 cubic foot of distilled water at 62° Fahr. = 1; of air and gases, 1 cubic foot of atmospheric air at 62° Fahr. = 1. The unit of heat, or thermal unit, the quantity of heat corresponding to a rise of 1° Fahr. in the temperature of 1 lb. of pure water at about 39° Fahr.; in France, the heat required to raise a gramme of pure water at about 3.94° C., 1° C.—In electricity the unit of

quantity is that quantity of electricity which, with an electro-motive force of one volt, will flow through a resistance of 1,000,000 ohms in one second, called a farad; unit of current, a current of one farad per second. Unit of work, that which will produce a velocity of one meter (39.37) inches per second in a mass weighing one gramme (15.432 grains) after acting upon it a second of time. A dynamic unit is one expressing the quantity of a force or the amount of work done. One such unit is the foot-pound (which see). The system of units recommended by a committee of the British association for scientific calculations, and known as the C. G. S. system, adopts the centimeter as the unit of length, the gramme as the unit of mass, and the second as the unit of time, these words being represented respectively by the above letters. (See Dynamics.) In this system the unit of area is the square centimeter, the unit of volume is the cubic centimeter, and the unit of velocity is a velocity of a centimeter per second. The unit of momentum is the momentum of a gramme moving with a velocity of a centimeter per second.

UNITARIANS, a religious sect or congenies of sects, distinguished by the denial of the received doctrine of the Trinity. The Unitarians may be divided into classes: (1) The conservative or orthodox Unitarians, who accept the general articles of the Christian creed (with the exception of the Trinity), such as miracles, the resurrection of Christ, and the plenary inspiration of Scripture. (2) The liberal or progressive Unitarians, whose creed is purely rationalistic. They consider Christ as a mere man, inspired as other great men are, though in a greater degree; they reject the doctrines of original sin, eternal punishments, the belief in miracles, and generally the whole supernatural element in Christianity. They deny the necessity of an atonement, considering Christ's death but as a martyrdom in defense of truth. This latter class forms the majority. Unitarian views have been held more or less in all ages of the church, but they came more prominently forward during the Reformation period, especially in connection with the teaching of the elder and younger Socinus, Lælius and Faustus, uncle and nephew. At this time Unitarian doctrines led to persecution. The sect was first tolerated in Poland and Transylvania. In the former country it flourished under the leadership of the younger Socinus, in the latter under that of his friend Blandrata. The Polish toleration was finally withdrawn in 1658, when the Unitarians were banished under pain of death. They dispersed in Germany and England. Unitarianism in the meantime made secret progress among various Protestant bodies professing orthodox creeds. In England, where Unitarians were burned as well as on the continent, full toleration was not granted till 1813. On the continent of Europe Unitarianism progressed in proportion to the progress of Rationalism. In America Unitarianism first sprung up in New England, from which it spread rapidly. The Universalist sect is also of non-Trinitarian

UNITARIANS

PROPORTION OF FOREIGN BORN WHITES 10 YEARS OF AGE AND OVER WHO
CANNOT SPEAK ENGLISH:



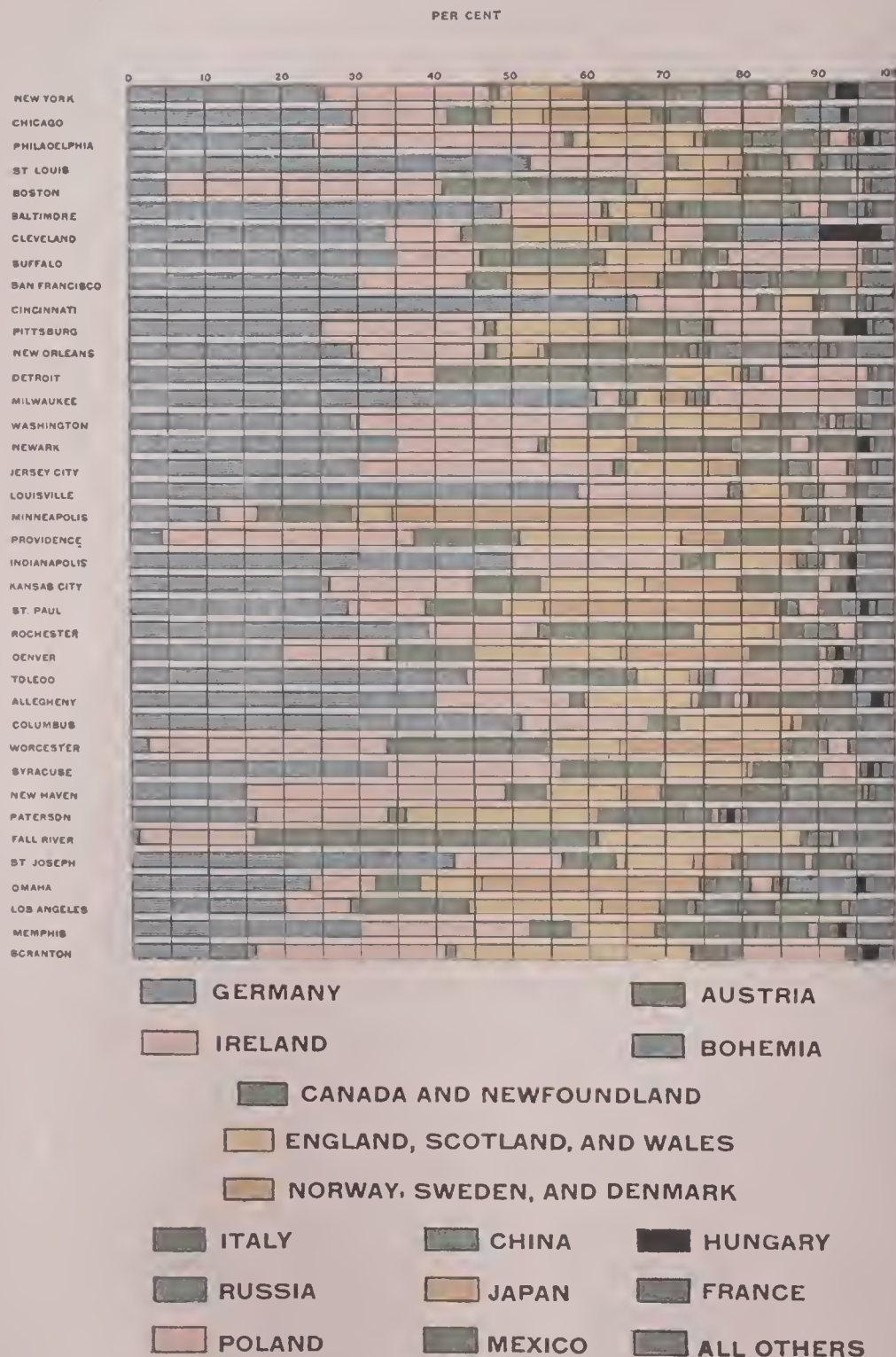
LESS THAN 10 PER CENT 10 TO 15 PER CENT 15 TO 25 PER CENT 25 PER CENT AND OVER

THE PREDOMINATING SEX:



FEMALES IN EXCESS MALES IN EXCESS 5 TO 10 PER CENT 20 PER CENT AND OVER
10 TO 20 PER CENT

PROPORTION OF FOREIGN BORN OF EACH LEADING NATIONALITY IN CITIES OF 100,000 AND OVER:



UNITED BRETHREN

belief. There are about 300 Unitarian congregations in Britain and 459 in America, and Unitarian theology has tinged more or less almost every section of the reformed Christian church.

UNITED BRETHREN. See Moravian Brethren.

UNITED KINGDOM. See Britain.

UNITED PRESBYTERIAN CHURCH, the name adopted by that Scottish church which was formed by the union of the Secession church and the Relief church in May, 1847. This church adhered to the theological doctrines taught in the Westminster Confession of Faith and the Larger and Shorter Catechisms. The system of church government differed from that of the Established and Free churches only in having no intermediate court between the presbyteries and the supreme court, the latter of which was called a General Synod, and sat once a year. The distinguishing feature of the United Presbyterian church was that it was a voluntary church, which set itself against all state establishment of religion and all public and national endowments for the maintenance of Christianity. In October, 1900, it joined with the Free church to form the United Free church of Scotland.

UNITED PROVINCES. See Netherlands.

UNITED STATES OF NORTH AMERICA, a federal republic, occupying the whole of the central portion of that continent between lat. 24° and 49° n., and lon. 67° and 125° w.; stretching from east to west between the Atlantic and North Pacific oceans, and from north

to south between Canada and the Gulf and Republic of Mexico; greatest length, east to west, 2800 miles; greatest breadth, 1600 miles; area, 3,024,880 sq. miles. The territory of Alaska also belongs to the United States, and Hawaii, the Philippines, Porto Rico, etc., have been recently acquired. The republic is composed of 46 states, 4 territories, and

1 district, besides the reserved Indian territory and Alaska. The first census was taken of the thirteen original states in 1790, when the population numbered 3,929,214. The various areas and populations are given in the following table:

States and Territories	Area in Sq. Miles	Population 1890	Estimated Pop. 1908 by the Governor of each State
<i>States</i>			
Alabama.....	52,250	1,513,017	2,250,000
Arkansas.....	53,850	1,128,179	1,750,000
California.....	158,360	1,208,130	2,000,000
Colorado.....	103,925	412,198	800,000
Connecticut.....	4,990	746,258	1,010,000
Delaware.....	2,050	168,493	190,000
Florida.....	58,680	391,422	650,000
Georgia.....	59,475	1,837,353	2,600,000
Idaho.....	84,800	84,385	300,000
Illinois.....	56,650	3,826,351	5,590,000
Indiana.....	36,350	2,192,404	2,678,492
Iowa.....	56,025	1,911,896	2,216,068
Kansas.....	82,080	1,427,096	1,680,000
Kentucky.....	40,400	1,858,635	2,435,000
Louisiana.....	48,720	1,118,517	1,700,000
Maine.....	33,040	661,086	731,760
Maryland.....	12,210	1,042,390	1,441,602
Massachusetts.....	8,315	2,238,943	3,173,487
Michigan.....	58,915	2,093,889	2,655,463
Minnesota.....	83,365	1,301,826	2,200,000
Mississippi.....	46,810	1,289,000	1,750,000
Missouri.....	69,415	2,679,184	3,885,989
Montana.....	146,080	132,159	275,000
Nebraska.....	76,855	1,058,910	1,225,000
Nevada.....	110,700	45,761	65,000
New Hampshire.....	9,305	376,530	443,700
New Jersey.....	7,815	1,444,933	2,294,413
New York.....	49,170	5,997,853	8,476,427
North Carolina.....	52,250	1,617,947	2,100,000
North Dakota.....	70,195	152,719	475,000
Ohio.....	41,060	3,672,316	4,557,000
Oklahoma.....	39,030	61,834	1,408,732
Oregon.....	96,030	313,767	550,000
Pennsylvania.....	45,215	5,258,014	6,900,000
Rhode Island.....	1,250	345,506	502,302
South Carolina.....	30,570	1,151,149	1,474,735
South Dakota.....	77,650	328,808	490,000
Tennessee.....	42,050	1,767,518	2,220,000
Texas.....	265,780	2,235,523	3,600,000
Utah.....	84,970	207,905	350,000
Vermont.....	9,565	332,422	340,000
Virginia.....	42,450	1,655,980	2,042,388
Virginia, West.....	24,780	762,794	1,200,000
Washington.....	69,180	349,390	900,000
Wisconsin.....	56,040	1,686,880	2,275,000
Wyoming.....	97,890	60,705	117,500
<i>Territories</i>			
Arizona.....	113,020	59,620	185,000
Hawaii.....	6,677	89,990	154,001
New Mexico.....	122,580	153,593	302,000
Dist. of Columbia.....	70	230,392	330,000
<i>States and Territories</i>			
Indian Territory.....	31,400	186,490	450,000
Indians.....	.....	141,709	134,158
Territ. of Alaska.....	531,400	31,795	125,000
Total.....	3,562,957	63,072,234	89,496,216

Up to 1889 the Dakotas formed the territory of Dakota. In 1890 Oklahoma was constituted a territory, being detached from the Indian territory. The colored people in 1907 numbered 8,840,789. The Indians in all amount approximately to 250,000. The capital is Washington, the largest city is New York, the other large cities being Chicago, Philadelphia, Boston, St. Louis, Baltimore, Cleveland, Buffalo, San Francisco, Cincinnati, Pittsburgh, etc. The following table shows the population of cities having over 100,000 inhabitants in 1900, for the census years 1860, 1890, 1900, and the estimated population in 1908 as furnished by the mayors of the different cities. The United States have a coast-line which measures 12,609 miles, of which 6861 are on the Atlantic, 2281 on the Pacific, and 3467 on the Mexican gulf. The most impor-

UNITED STATES

City	1908	1900	1890	1860
New York.....	4,285,435	3,437,202	1,515,301	813,669
Chicago.....	2,483,641	1,698,575	1,099,820	109,260
Philadelphia.....	1,491,161	1,293,697	1,046,964	565,529
Brooklyn.....	*	*	838,547	279,122
Saint Louis.....	750,000	575,238	451,770	160,773
Boston.....	607,340	560,892	448,477	177,840
Baltimore.....	567,000	508,957	434,439	212,418
Cleveland.....	525,000	381,768	261,353	43,417
Buffalo.....	400,000	352,387	255,664	81,129
San Francisco.....	475,000	342,782	298,997	56,802
Cincinnati.....	400,000	325,902	296,908	161,044
Pittsburg.....	350,000	321,616	238,617	49,221
New Orleans.....	400,000	287,104	242,039	168,675
Detroit.....	425,600	285,704	205,876	45,619
Milwaukee.....	355,000	285,315	204,468	45,246
Washington.....	332,000	278,718	230,392	61,122
Newark.....	300,000	246,070	181,830	71,941
Jersey City.....	245,000	206,433	163,003	29,226
Louisville.....	260,000	204,731	161,129	68,033
Minneapolis.....	300,000	202,718	164,738	2,564
Providence.....	208,000	175,597	132,146	50,666
Indianapolis.....	236,000	169,164	105,436	13,611
Kansas City.....	250,000	163,752	132,716	4,418
Saint Paul.....	225,000	162,065	133,596	10,401
Rochester.....	195,000	168,608	138,866	48,204
Denver.....	200,000	133,859	106,713	4,749
Toledo.....	189,000	131,822	81,434	13,768
Allegeny.....	138,000	129,896	105,287	28,702
Columbus.....	179,370	125,560	88,150	18,554
Worcester.....	138,000	118,421	84,655	24,960
Syracuse.....	125,000	108,374	88,143	28,119
New Haven.....	150,000	108,027	81,298	39,267
Paterson.....	130,000	105,171	78,347	19,586
Fall River.....	115,000	104,863	74,398	14,026
Saint Joseph.....	120,000	102,979	52,324	8,932
Omaha.....	142,500	102,555	140,452	1,883
Los Angeles.....	280,000	102,479	50,395	4,385
Memphis.....	175,000	102,320	64,495	22,623
Scranton.....	130,000	102,026	75,215	9,223
Portland.....	161,205	90,426	45,585	.....
Reading.....	110,000	78,961	56,661	.....
Richmond.....	112,000	85,050	81,888	.....
Seattle.....	250,000	80,671	42,839	.....
St. Joseph, Mo.....	120,000	102,979	52,324	.....
Albany.....	100,000	91,104	94,923	.....
Atlanta.....	150,000	89,872	65,533	.....
Dallas.....	280,000	42,638	38,067	.....
Dayton.....	115,000	85,333	61,220	.....
Grand Rapids.....	117,000	87,563	60,278	.....
Hartford.....	106,000	79,580	53,230	.....
Lowell.....	100,000	94,969	77,696	.....
Nashville.....	125,000	80,865	70,168	.....

* The City of Brooklyn was consolidated with New York City in 1898.

tant indentations on the Atlantic are Massachusetts bay; Long Island sound, and in connection with it the Bay of New York; Delaware bay; Chesapeake bay; Albemarle and Pamlico sounds; and the Gulf of Mexico. The Pacific seaboard is deficient in bays, but possesses in that of San Francisco, on the coast of California, one of the largest natural harbors in the world. There are few islands either on the Atlantic or Pacific coasts, the only one of any importance being Long Island. The country is traversed by two great mountain-systems. The loftiest and largest of these is what as a whole may be called the Cordilleras, which enters from Mexico, stretches northward, and is continued into the Dominion of Canada. It has in its broadest parts a breadth of 1000 miles, and includes the ranges known as the Rocky mountains, Sierra Nevada, Cascade range, the Coast ranges, the Blue mountains, and various lofty plateaus. The great feature of this system is the Rocky mountains (which see). The other mountain-system is the Appalachian, which stretches parallel to the Atlantic coast almost from the Gulf of Mexico to the St. Lawrence. It consists of a long plateau with various groups and ranges of hills, among which are the White mountains in New Hampshire, the Green mountains of Vermont, the Adirondacks of northern New York, the Catskills of southeastern New York,



Obverse.



Reverse.

Great seal of the U. S.

to south between Canada and the Gulf and Republic of Mexico; greatest length, east to west, 2800 miles; greatest breadth, 1600 miles; area, 3,024,880 sq. miles. The territory of Alaska also belongs to the United States, and Hawaii, the Philippines, Porto Rico, etc., have been recently acquired. The republic is composed of 46 states, 4 territories, and

the Alleghanies of Pennsylvania, etc. The great plain lying between these two mountain-systems belongs almost entirely to the basin of the Mississippi-Missouri, which enters the Gulf of Mexico. This, the chief river of the country and the longest in the world, is of immense importance as a highway of internal trade. Its principal tributaries are the Ohio, Arkansas, Red river, and Illinois. Various other rivers enter the Mexican gulf, including the Rio Grande del Norte, which separates the States from Mexico. The country west of the Rocky mountains, belonging to the basin of the Pacific, is drained by the Columbia, which falls into the Pacific between Oregon and Washington; the Sacramento, which discharges into the Bay of San Francisco; and the Colorado, which falls into the Gulf of California. Between the Alleghanies and the Atlantic the principal rivers are the Connecticut, which falls into Long Island sound; the Hudson, which contributes to form the harbor of New York; the Delaware, which falls into the bay of that name, and is navigable to Philadelphia; the Potomac; which falls into Chesapeake bay, and is navigable to Washington; and the Savannah, which enters Savannah bay. Besides Lake Champlain, which divides the states of Vermont and New York, and the Great Salt Lake in Utah, there are the great lakes Superior, Michigan, Huron, Erie, and Ontario lying between the United States and Canada, and belonging partly to both. The geology of the United States divides itself roughly into two large geographical areas. One of these areas extends from the Atlantic to the base of the Rocky mountains, and this is occupied to a large extent by a great basin of Palæozoic formations, including the Cambrian, Silurian, Devonian, and Carboniferous divisions. In the other great geological area, which extends from the base of the Rocky mountains to the Pacific, the Eozoic and Palæozoic formations which predominate are overlaid by rocks of the Secondary and Tertiary periods. As many of the deposits are carboniferous, coal is found in a large proportion of the states, but is chiefly worked in Pennsylvania; the total yield for the states being 413,838,679 tons in 1906. (See table). About one-fifth belongs to the anthracite variety. Iron ore, like coal, is widely distributed, being at present mined in no fewer than twenty-seven states. The total amount of pig-iron produced in 1906 was 25,712,106 tons, and of steel 23,738,587. The United States is the chief gold and silver producing country in the world, its mines being chiefly situated in Colorado, California, and Nevada. During 1906 the total production of gold was valued at \$94,373,800, and the value of the silver obtained amounted to \$38,256,400. Among the other chief metals are copper, the output of which in 1906 was 416,226 tons, lead, zinc, and mercury. Petroleum forms an important mineral resource of the states of Pennsylvania, New York and Illinois. (See page opposite for table giving the production of ores, minerals, secondary minerals and chemicals for the year 1906.)

The following table gives the coal production by states for the year 1906:

States	Tons	Value at Mine	
		Total	Per Ton
<i>Bituminous</i>			
Alabama.....	12,851,775	\$17,349,896	\$1.35
Arkansas.....	1,875,569	2,438,240	1.30
California.....	80,000	232,000	2.90
Colorado.....	10,308,421	13,916,368	1.35
Georgia, N. Carol.	363,463	407,247	1.12
Illinois.....	38,317,581	39,467,108	1.03
Indiana.....	11,422,000	11,878,880	1.04
Indian Territory..	2,980,600	5,663,140	1.90
Iowa.....	7,017,485	10,877,102	1.55
Kansas.....	6,010,858	8,935,195	1.49
Kentucky.....	9,740,420	10,714,462	1.10
Maryland.....	5,014,995	6,772,243	1.35
Michigan.....	1,370,860	2,193,376	1.60
Missouri.....	3,860,000	6,176,000	1.60
Montana.....	1,787,934	3,186,620	1.78
New Mexico.....	1,973,658	2,960,487	1.50
North Dakota....	300,998	937,894	1.45
Ohio.....	27,213,495	29,934,845	1.10
Oregon.....	79,731	212,338	2.66
Pennsylvania.....	129,532,991	145,076,950	1.12
Tennessee.....	6,210,000	7,141,500	1.15
Texas.....	1,290,600	2,064,960	1.60
Utah.....	1,839,219	2,942,750	1.60
Virginia.....	4,546,040	8,501,095	1.87
Washington.....	3,293,098	6,421,541	1.95
West Virginia....	46,452,000	44,129,400	.95
Wyoming.....	5,805,322	10,159,311	1.75
Alaska, Nevada..	90,000	360,000	4.00
Total bituminous	341,629,113	\$400,550,951	\$1.17
<i>Anthracite</i>			
Colorado.....	50,000	\$155,000	\$3.10
New Mexico.....	20,000	70,000	3.50
Pennsylvania.....	72,139,566	166,082,002	2.30
Total anthracite..	72,209,566	\$166,307,002	\$2.30
Total } Sh. Tons..	413,838,679	\$566,857,953	\$1.37
Coal } Met. Tons.	375,397,204	.....	1.51

Salt springs abound in various localities, and salt is produced in great quantities in New York, Virginia, Pennsylvania, Ohio, and Kentucky. Extensive beds of gypsum are found in New York, Maine, Virginia, and other states, and marble, fine granite, sandstone, porphyry, etc., are abundant. A country like the United States, stretching over such a vast latitude and having such wide areas of mountain and plain, must necessarily present a great variety of climate. Thus the annual rainfall ranges from 123 inches in Washington state to 6 inches in Colorado; while the mean annual temperature, which is 69° in Florida, is 41° in Wyoming. Along the Atlantic seaboard westerly winds prevail, while on the Californian coast the winds are almost steadily southwest or northwest. The climate, taken as a whole, is favorable to the growth of forest vegetation, and thickly-wooded regions extend along the Atlantic coast from Maine to Florida; on the Pacific coast, and the Cordilleran ranges; and in the Mississippi basin. In these areas the more important hardwood trees are the sugar-maple and soft-maple, oak (in several varieties), white ash, chestnut, birch, hickory, walnut, elm, beech, tulip-tree, fir, yellow pine, redwood, and cedar. There is also great variety and abundance of fruits, both of the temperature and tropical climates. Among wild animals are the bison or buffalo, now almost extinct in a wild state, the moose or American elk, the prong-horned antelope, the big-horned or Rocky mountain sheep, the wapiti or American stag, the peccary, the cougar or puma, the black and the grizzly bear, the jaguar, the prairie wolf, the racoon,

the opossum, and beaver. Among the birds are swans, wild turkeys, wild geese, wild ducks, eagles, vultures, the mocking-bird, humming-birds, etc. Among reptiles are the rattlesnake and other snakes, turtles, and tortoises, alligators, etc. It is estimated that the arable land of the United States exceeds a million and a quarter sq. miles. The total acreage of farms is nearly 900,000,000 acres. The total value of the agricultural and horticultural crops in 1907 was \$3,500,000,000 not including live stock, the total value of which was over \$3,000,000,000.

(See pages 1272 and 1273 for tables giving the production of cereal crops by states and farm products of the United States for the year 1906.)

Immigration into the United States for the period 1900-1907:

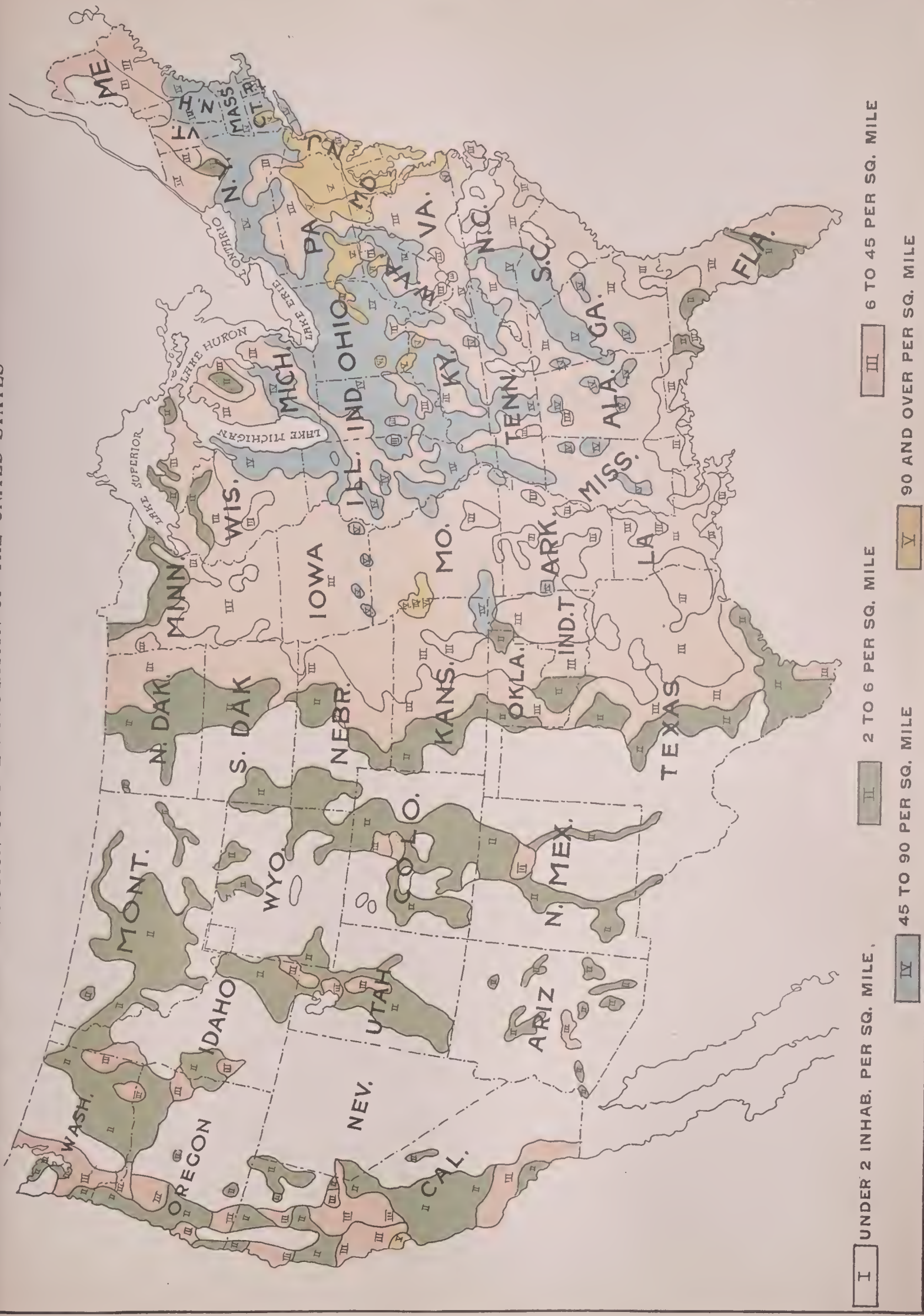
1900.....	448,572
1901.....	487,918
1902.....	648,743
1903.....	857,046
1904.....	812,870
1905.....	1,027,421
1906.....	1,100,735
1907.....	1,285,349
Total.....	6,668,634
1820 to 1899.....	19,316,593
1789 to 1820 est.....	250,000
	26,234,227

The reported occupations of immigrants arriving during the fiscal year 1907 were as follows: Laborers, 291,141; servants, 121,587; farm laborers, 323,854; tailors, 30,644; merchants and dealers, 14,470; carpenters, 20,656;

IMMIGRATION BY COUNTRIES IN FISCAL YEARS 1906 AND 1907.

Countries	1906	1907
Austria-Hungary.....	265,138	338,452
Belgium.....	5,099	6,396
Bulgaria, Servia and Montenegro.....	4,666	11,359
Denmark.....	7,741	7,243
France, including Corsica.	9,386	9,731
German Empire.....	37,564	37,807
Greece.....	19,489	36,580
Italy, including Sicily and Sardinia.....	273,120	285,731
Netherlands.....	4,946	6,637
Norway.....	21,730	22,133
Portugal, inc. Cape Verde and Azore Islands.....	8,517	9,608
Roumania.....	4,476	4,384
Russian Empire, and Finland.....	215,665	258,943
Spain including Canary and Balearic Islands....	1,921	5,784
Sweden.....	23,310	20,589
Switzerland.....	3,846	3,748
Turkey in Europe.....	9,510	20,767
England.....	49,491	56,637
Ireland.....	34,995	34,530
Scotland.....	15,866	19,740
Wales.....	1,841	2,660
Other Europe.....	48	107
Total Europe.....	1,018,365	1,199,566
China.....	1,544	961
Japan.....	13,835	30,224
India.....	216	898
Turkey in Asia.....	6,354	8,053
Other Asia.....	351	386
Total Asia.....	22,300	40,524
Africa.....	712	1,484
Australia, Tasmania, and New Zealand.....	1,682	1,941
Pacific Isles, not specified.	51	42
British North America....	5,063	19,918
Central America.....	1,140	935
Mexico.....	1,997	1,406
South America.....	2,757	2,779
West Indies.....	13,656	16,689
Other Countries.....	33,012	22
Grand Total.....	1,100,735	1,285,349

DISTRIBUTION OF THE POPULATION OF THE UNITED STATES



UNITED STATES

shoemakers, 13,059; clerks, 11,980; mariners, 7270; miners, 11,452. The number of professional immigrants (including 822 actors, 2433 engineers, 1114 musicians, and 1673 teachers) was 12,600; of skilled laborers, 190,315; miscellaneous (including unskilled), 777,725, no occupation (including children), 304,709.

Owing to the great difficulty in obtaining accurate statements of the immigrants from the contiguous countries of Canada and Mexico, no statistics of immigration into the United States of citizens of those countries are gathered by the Bureau of Immigration. The constant ebb and flow of persons entering and leaving the United States from and to Mexico and Canada, at the numerous points where such movements can be conveniently made, renders accurate statements on this subject extremely difficult, and the Bureau of Immigration in its annual report for 1902 states that "the immigrants do not include arrivals from the neighboring countries of Mexico and Canada except such as come from abroad through ports in these countries for the avowed purpose of entering the United States." The facts, however, that the census of 1900 shows the presence of 1,183,225 persons in the United States born in Canada and 103,445 persons born in Mexico proves that the number of arrivals from those countries, proper to be considered as immigrants, must be large.

The average farm is 146 acres. Among cultivated crops the most important are wheat, the great staple of the western and middle states; corn, most productive in the middle states; tobacco, a staple in Virginia, Kentucky, Maryland, and Tennessee; cotton, a staple in Texas, Alabama, Mississippi, Georgia, and the Carolinas; barley, oats, rye, sugar, hemp, flax, potatoes, and hay.

The following table shows the tobacco production by states for the year 1905:

States	Product, Pounds	Acreage, Acres	Farm Value
Kentucky.....	28,975,420	275,874	\$16,028,279
North Carolina...	83,156,160	136,770	7,317,742
Virginia.....	79,951,725	118,447	6,076,331
Wisconsin.....	53,832,780	39,294	5,383,278
Ohio.....	50,344,650	59,229	4,228,951
Tennessee.....	31,873,536	41,502	2,390,515
Connecticut.....	23,011,500	13,340	3,911,955
Pennsylvania.....	20,993,880	15,324	2,267,339
Maryland.....	19,592,950	30,143	1,175,577
South Carolina...	9,254,464	12,574	805,138
Massachusetts...	8,302,800	4,488	1,403,173
New York.....	7,061,348	6,151	741,442
Indiana.....	5,113,836	6,244	306,830
Florida.....	3,192,600	5,321	574,668
West Virginia...	3,163,950	4,005	268,936
Other States.....	5,211,920	7,406	638,714
Total U. S.....	633,033,719	776,112	\$53,519,068

In the same year the production of other states than those above reported was, in pounds: New Hampshire, 212,500; Vermont, 315,150; Georgia, 1,068,900; Missouri, 1,295,370; Alabama, 284,450; Mississippi, 66,650; Louisiana, 31,500; Texas, 234,500; Arkansas, 734,300; Illinois, 1,018,800.

The most remarkable development of any phase of American agriculture is in fruit culture. This industry has almost doubled in magnitude. The number of orchard trees has increased from 193,-

UNITED STATES

THE FOLLOWING TABLE GIVES THE PRODUCTION OF ORES, MINERALS, SECONDARY MINERALS AND CHEMICALS FOR THE YEAR 1906.

PRODUCTS	MEASURES	1906	
		QUANTITY	VALUE
Antimony ore.....	Sh. T.	295	\$44,250
Asbestos.....	Sh. T.	1,695	20,565
Asphaltum (u).....	Sh. T.	116,653	1,066,019
Barytes.....	Sh. T.	63,486	252,719
Bauxite.....	L. T.	78,331	352,490
Chrome ore.....	L. T.	180	1,800
Coal, anthracite.....	Sh. T.	72,209,566	166,307,002
Coal, bituminous.....	Sh. T.	341,629,113	400,550,951
Diatomaceous earth.....	Sh. T.	.....	.....
Emery.....	Sh. T.	2,147	22,780
Feldspar (u).....	Sh. T.	72,656	401,531
Flint (u).....	Sh. T.	66,697	243,012
Fluorspar.....	Sh. T.	34,683	201,481
Fuller's earth.....	Sh. T.	28,000	237,950
Garnet.....	Sh. T.	5,404	179,548
Graphite, amorphous.....	Sh. T.	16,853	102,175
Graphite, crystalline.....	Lb.	4,894,483	170,866
Gypsum (u).....	Sh. T.	1,540,585	3,837,975
Iron ore.....	L. T.	49,237,129	107,091,574
Limestone flux.....	L. T.	15,486,139	7,339,125
Magnetite (u).....	Sh. T.	7,805	23,415
Manganese ore.....	L. T.	(u) 141,681	306,993
Mica, sheet (u).....	Lb.	1,423,100	252,248
Mica, scrap (u).....	Sh. T.	1,489	22,742
Monazite (u).....	Lb.	486,175	152,312
Petroleum, crude.....	Bbl. (i)	131,771,505	80,277,279
Phosphate rock.....	L. T.	2,052,742	12,342,741
Pumice.....	Sh. T.	12,200	16,750
Pyrites.....	L. T.	225,045	767,866
Quartz, crystalline.....	Sh. T.	.....	.....
Salt (u).....	Bbl. (k)	28,172,380	6,658,350
Sand, glass.....	Sh. T.	1,089,430	1,208,788
Slate, roofing.....	Squares (f)	1,214,742	5,668,346
Soda, natural.....	Sh. T.	.....	.....
Sulphur.....	L. T.	285,000	6,056,250
Talc, common.....	Sh. T.	58,972	874,356
Talc, fibrous.....	Sh. T.	64,200	541,600
Tungsten ore.....	Sh. T.	1,096	442,784
Whetstones and Oilstones (u).....	.....	.....	268,070
Zinc ore.....	Sh. T.	905,175	17,250,420
Total enumerated.....	.....	.....	\$821,555,123

SECONDARY MINERALS AND CHEMICALS.

Alundum.....	Lb.	4,331,233	\$303,186
Ammonium sulphate.....	Sh. T.	75,000	4,674,750
Arsenic.....	Lb.	1,663,000	83,150
Borax.....	Sh. T.	58,173	1,182,410
Bromine.....	Lb.	1,229,000	184,350
Carborundum.....	Lb.	6,225,280	622,528
Cement, nat. hyd. (u).....	Bbl. (g)	3,935,151	2,362,140
Cement, Portland (u).....	Bbl. (h)	46,610,822	51,240,652
Cement, slag (u).....	Bbl. (h)	481,224	412,912
Coke.....	Sh. T.	32,690,362	86,887,392
Copper sulphate (c).....	Lb.	50,925,932	3,157,408
Copperas.....	Sh. T.	22,839	228,390
Crushed steel.....	Lb.	837,000	58,590
Graphite, artificial.....	Lb.	4,868,000	312,764
Lead, white.....	Sh. T.	123,640	15,234,297
Lead, sublimed white.....	Sd. T.	7,988	798,880
Lead, red.....	Sh. T.	13,693	1,874,448
Lead, orange mineral.....	Sh. T.	2,927	421,488
Litharge.....	Sh. T.	13,816	1,890,050
Mineral wool.....	Sh. T.	6,357	55,550
Zinc oxide (m).....	Sh. T.	77,800	6,257,361
Total.....	.....	.....	\$178,242,696
Aluminum.....	Lb.	14,350,000	\$5,166,000
Antimony.....	Lb.	5,858,000	1,272,509
Copper.....	Lb.	917,620,000	180,000,339
Ferromanganese (q).....	L. T.	300,500	24,040,000
Gold (fine).....	Troy oz.	4,648,385	96,101,400
Iron (pig).....	L. T.	25,006,691	453,871,441
Lead.....	Sh. T.	345,529	39,093,151
Nickel (s).....	Sh. T.	7,150	6,360,640
Platinum.....	Troy oz.	1,439	45,189
Quicksilver.....	Flasks. (o)	28,293	1,157,184
Silver (fine).....	Troy oz.	56,183,500	37,525,521
Zinc.....	Sh. T.	225,494	27,961,256
Total metals.....	.....	.....	\$872,514,630
Total ores and minerals.....	.....	.....	821,555,123
Secondary products.....	.....	.....	178,242,696
Grand total enumerated.....	.....	.....	\$1,872,312,449

(c) Includes sulphate made from metallic copper. (d) Includes manganiferous iron ore. (e) Estimated. (f) One "square" covers 100 square feet. (g) Barrels of 265 lbs. (h) Barrels of 380 lbs. (i) Barrels of 42 gallons. (k) Includes salt used in manufacture of alkali; the barrel of salt weighs 280 lbs. (m) Includes a small quantity made from spelter. (o) Flasks of 75 lbs. (q) Includes spiegeleisen, though the value is given as for ferromanganese. (s) Includes nickel from Canadian ores smelted in the United States. (t) Barrels of 330 lbs. (u) Figures reported by the United States Geographical survey. (w) Excludes Lake Superior manganiferous iron ore which is included in iron ore proper.

UNITED STATES

452,588 to 387,164,694 (not including sub-tropical varieties). Most varieties of temperate zone fruits are grown in every state. The use of refrigerator cars has made it possible to transport fruits long distances, and thus all parts of the country have the advantage of the general market. However, climatic differences tend to localize. From the following table it will be seen that the apple has a decided primacy among American fruits:

Fruits	Trees
Apples.....	211,794,764
Peaches and nectarines.....	104,919,428
Pears.....	19,716,184
Plums and prunes.....	82,780,892
Cherries.....	12,943,287
Apricots.....	5,010,139
Total.....	387,164,694

The cotton crop of the United States in 1906-7 was as follows:

States	1906-07 Bales
North Carolina.....	644,000
South Carolina.....	941,000
Georgia.....	1,728,000
Florida.....	66,000
Alabama.....	1,332,000
Mississippi.....	1,548,000
Louisiana.....	980,000
Texas.....	4,073,000
Arkansas.....	915,000
Tennessee.....	317,000
All Others.....	1,007,000
Total Crop.....	13,551,000

The culture of the vine has made great progress, chiefly in Ohio, Pennsylvania, Indiana, North Carolina, Missouri, and especially California. The forest area (exclusive of Alaska) is estimated at about 500,000,000 acres, about seven-tenths being on the Atlantic side, one-tenth on the Pacific, one-tenth on the Rocky Mountains and one-tenth in the interior of the Western States. Three-fourths of the timber cut annually is pine, and the remainder oak and other hard woods. Horses are largely bred, and mules and asses in the southern states. The total number and value of the domestic animals in the United States is as follows:

Domestic Animals	Total		On Farms and Ranges		Not on Farms or Ranges	
	Number	Value	Number	Value	Number	Est. Value
All Domestic Animals.....	.....	\$3,193,856,459	.....	\$2,979,197,586	.....	\$214,658,873
Neat cattle, cows, bulls, &c.....	69,335,832	\$1,516,307,270	67,719,410	\$1,475,204,633	1,616,422	\$41,102,637
Horses and colts.....	21,203,901	1,050,526,967	18,267,020	896,513,217	2,936,881	154,013,750
Mules.....	3,438,523	207,274,557	3,264,615	196,222,053	173,908	11,052,504
Asses and burros.....	110,012	6,776,583	94,165	5,811,184	15,847	965,399
Sheep and lambs.....	61,735,014	170,881,743	61,503,713	170,203,119	231,301	678,624
Swine.....	64,686,155	238,686,872	62,868,041	231,978,031	1,818,114	6,708,841
Goats.....	1,948,952	3,402,467	1,870,599	3,265,349	78,353	137,118

Horned cattle and sheep are raised in great numbers, hog-rearing forms an important industry, and immense quantities of cheese and butter are made. The staple manufactures are cottons, woollens, iron and steel and articles in iron and steel, other important occupations being those connected with clothing and boots and shoes, furniture, lumbering, flour-milling, meat-packing, etc. The cotton manufacture is carried on chiefly in Massachusetts, Pennsylvania, Rhode

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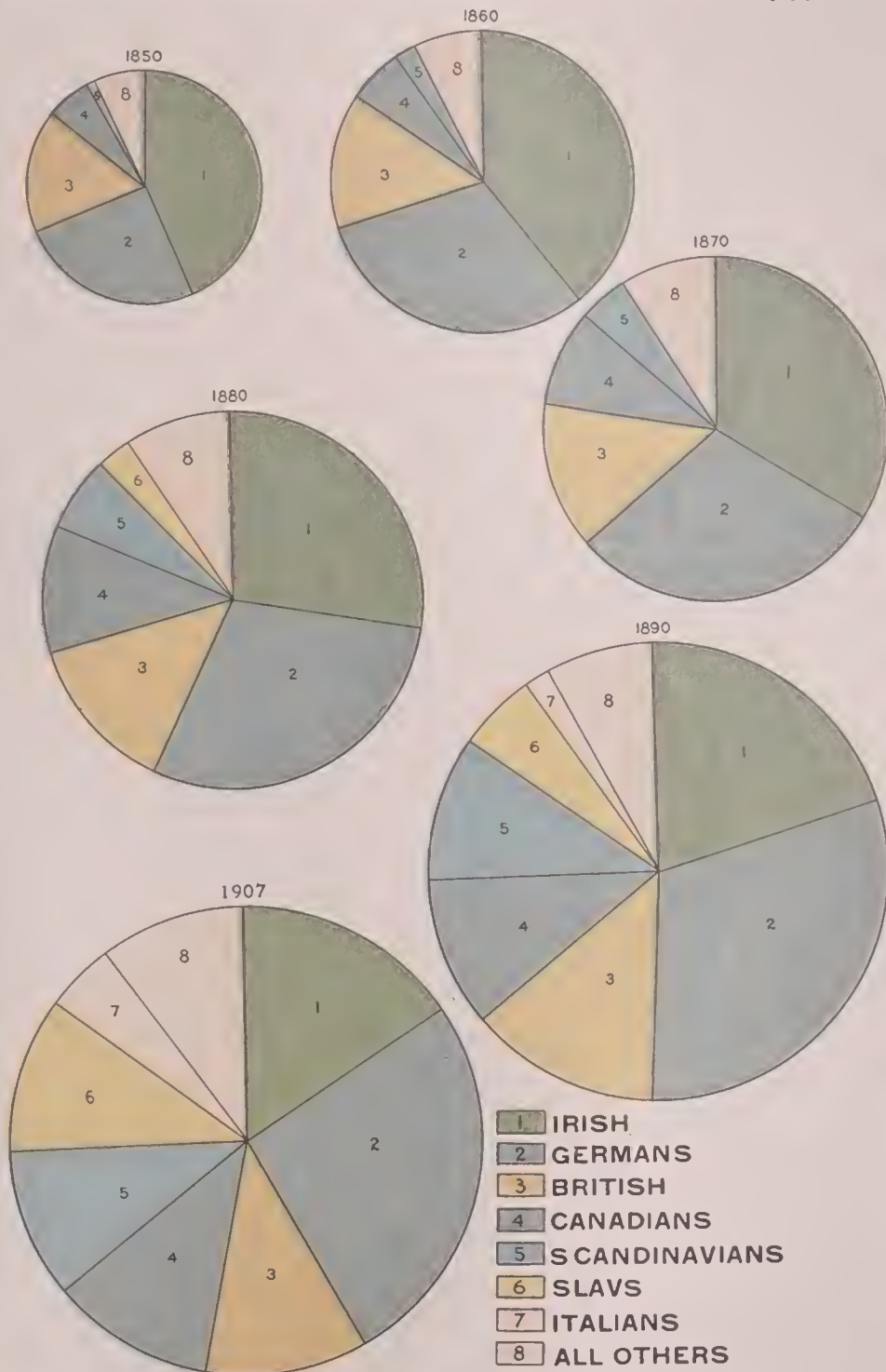
THE FOLLOWING TABLE GIVES THE PRODUCTION OF THE PRINCIPAL CEREAL CROPS BY STATES FOR THE YEAR 1906.

STATES AND TERRITORIES	OATS BUSHELS	CORN BUSHELS	WHEAT BUSHELS
Maine.....	4,038,849	456,950	199,342
New Hampshire.....	424,212	983,775	.....
Vermont.....	2,862,726	2,005,430	30,952
Massachusetts.....	214,472	1,778,520	.....
Rhode Island.....	46,997	331,364	.....
Connecticut.....	341,179	2,223,800	.....
New York.....	40,233,784	22,685,000	9,350,180
New Jersey.....	1,662,819	10,082,289	2,033,002
Pennsylvania.....	31,816,496	57,960,239	29,073,188
Delaware.....	95,991	5,894,160	1,947,920
Maryland.....	808,584	22,007,825	12,902,416
Virginia.....	2,858,634	45,188,523	9,306,825
West Virginia.....	2,101,200	22,725,000	4,879,861
North Carolina.....	3,169,724	41,796,846	5,297,028
South Carolina.....	3,538,292	23,611,233	2,960,041
Georgia.....	3,362,291	52,066,596	3,161,070
Florida.....	394,240	6,875,000	.....
Ohio.....	48,280,000	141,645,000	43,202,100
Indiana.....	50,196,000	183,893,767	48,080,925
Illinois.....	107,763,500	347,169,585	38,535,900
Michigan.....	43,747,500	54,575,000	13,644,960
Wisconsin.....	91,630,000	60,105,732	4,690,816
Minnesota.....	72,011,160	50,149,277	55,801,591
Iowa.....	140,777,000	373,275,000	9,212,218
Missouri.....	14,685,503	228,522,500	31,734,900
North Dakota.....	40,485,608	4,170,000	77,896,000
South Dakota.....	46,410,000	62,812,500	41,955,400
Nebraska.....	72,275,000	249,782,500	52,288,692
Kansas.....	24,780,000	195,075,000	81,830,611
Kentucky.....	4,430,354	105,437,376	11,542,598
Tennessee.....	3,151,320	86,428,912	10,892,725
Alabama.....	3,167,879	47,849,392	1,085,029
Mississippi.....	1,626,732	40,789,207	17,610
Louisiana.....	486,227	26,217,633	.....
Texas.....	31,822,512	155,804,782	14,126,186
Indian Territory.....	7,446,571	68,493,264	2,890,188
Oklahoma.....	12,040,000	65,737,326	18,663,862
Arkansas.....	3,783,706	52,802,569	1,915,250
Montana.....	8,501,846	93,132	3,297,336
Wyoming.....	1,979,068	68,256	871,102
Colorado.....	5,962,394	3,157,136	8,266,538
New Mexico.....	424,507	1,182,203	1,120,650
Arizona.....	31,442	220,129	391,658
Utah.....	2,053,900	356,032	4,888,626
Nevada.....	252,898	.....	869,526
Idaho.....	4,390,065	148,037	8,231,631
Washington.....	7,463,534	288,389	25,075,258
Oregon.....	9,621,508	499,091	14,215,597
California.....	5,156,298	1,994,814	26,883,663
Total bushels.....	964,904,522	2,927,416,091	735,260,970
Total acres.....	30,958,768	96,737,581	47,305,829
Value.....	\$306,292,978	\$1,166,626,479	\$490,332,760
Yield per acre.....	31.2	30.3	15.5
Farm price.....	31.7	39.9	66.7

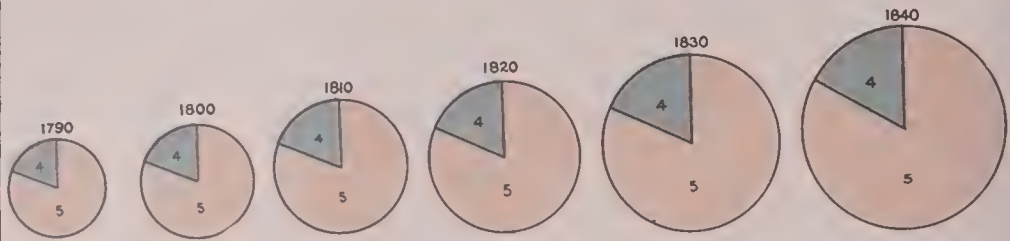
Island, Connecticut, and New York; the woolen manufacture chiefly in Massachusetts, New York, Connecticut, Pennsylvania, New Hampshire, Rhode Island, Vermont and Ohio; and the most important centers of the iron industry are Philadelphia, Pittsburg, Cincinnati, New York, Baltimore, and St. Louis. Besides these, all ordinary manufac-

tattle. Other important exports are mineral oil, tobacco, sugar, fruits, tar, pitch, rosin, and turpentine; tallow and hides, lard, hops, oil-cake, clover seed, copper and copper ore, skins and furs. The more important manufactured exports are cotton goods, cotton twist, iron and articles in iron, articles in wood, leather, boots, and shoes, agricultural implements, cutlery, etc. The value of bread-stuffs exported in 1907 was \$168,222,482; raw cotton, \$481,277,797; provisions, \$202,392,508; manufactured and unmanufactured iron and steel, \$181,530,871; tobacco, leaf and manufactured, \$39,113,011; petroleum, \$78,228,819; wood and wooden manufactures, \$83,349,575. The total exports to Great Britain in 1907 amounted to \$607,783,255. The fisheries, in addition to dried fish and oysters, furnish exports of whale and other fish oil, spermaceti, whalebone, etc. There is also a large export of gold in the forms both of coin and bullion. Among the principal articles of import are sugar, valued at \$92,806,253; coffee, \$78,231,902; wool and woolen manufactures, \$63,855,265; raw silk and silk manufactures, \$110,045,150; cotton goods, \$73,704,636; chemicals, dyes, etc., \$82,997,914; hides and skins, \$83,206,545; fruit, including nuts, \$35,807,527. The value of the

FOREIGN BORN AT EACH CENSUS, WITH THE PROPORTION
OF EACH LEADING NATIONALITY: 1850 TO 1900.

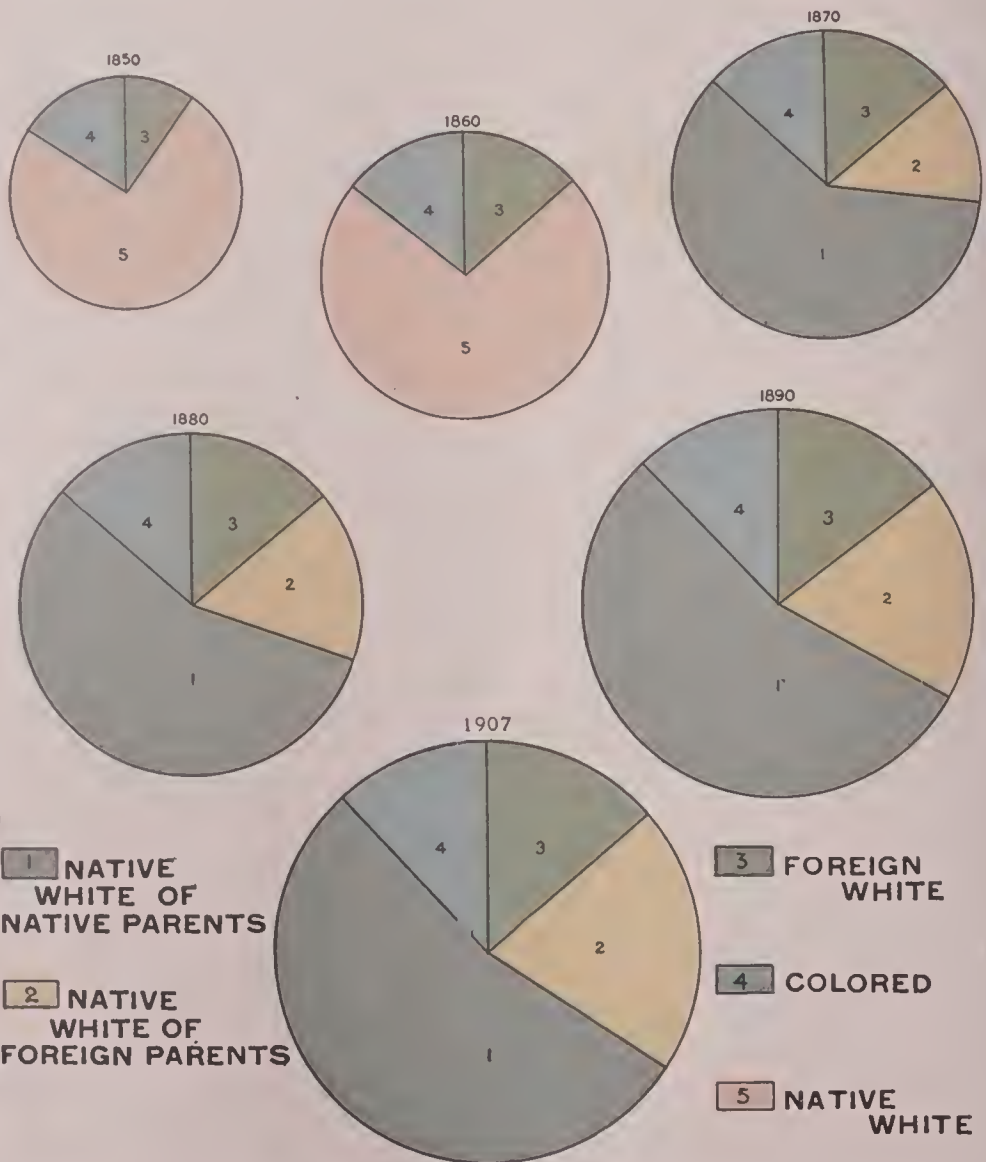


THE TOTAL POPULATION AND ITS ELEMENTS



1790 TO 1840 WHITE

COLORED



1 NATIVE WHITE OF NATIVE PARENTS

2 NATIVE WHITE OF FOREIGN PARENTS

3 FOREIGN WHITE

4 COLORED

5 NATIVE WHITE

UNITED STATES

THE FOLLOWING TABLE GIVES THE FARM PRODUCTIONS OF THE UNITED STATES FOR THE YEAR 1906.

CROP	YEAR	UNIT OF MEASURE	QUANTITY	VALUE
Animals.....	1907	Number	204,131,992	\$4,423,697,853
Apples.....	Census	Bush.....	175,397,600	(a)
Apricots.....	Census	Bush.....	2,642,128	(a)
Beans, Castor.....	Census	Bush.....	143,388	134,084
Beans, Dry.....	Census	Bush.....	5,064,490	7,633,636
Bees.....	Census	Swarms.....	4,109,626	10,186,513
Broom Corn.....	Census	Pounds.....	90,947,370	3,588,414
Butter.....	1905	Pounds.....	531,478,141	113,189,452
Cereals (b) (l).....	1906	Bush.....	4,854,514,837	(h) 2,065,886,900
Cheese.....	1905	Pounds.....	317,144,872	28,611,760
Chicory.....	Census	Pounds.....	21,495,870	73,627
Cider.....	Census	Barrels.....	1,754,927	(a)
Cotton.....	1906	Pounds.....	6,351,107,861	640,311,538
Cotton Seed.....	1905	Tons.....	5,060,205	(c) 75,564,041
Flaxseed.....	1906	Bush.....	25,576,146	(h) 25,899,165
Flowers, Plants.....	Census	.....	.....	18,758,864
Forest Products.....	Census	.....	.....	109,864,774
Fruits, small.....	Census	.....	.....	25,029,757
Fruits, sub-tropical.....	Census	.....	.....	8,227,838
Grapes.....	Census	Central.....	13,009,841	(d) 14,090,234
Hay.....	1906	Tons.....	57,145,950	(h) 592,539,671
Hemp.....	Census	Pounds.....	11,750,630	546,338
Honey (e).....	Census	Pounds.....	62,862,885	6,656,611
Hops.....	Census	Pounds.....	49,200,704	4,081,929
Milk (i).....	Census	Gallons.....	7,265,804,304	.....
Molasses.....	Census	Gallons.....	6,312,809	788,990
Nursery products.....	Census	.....	.....	10,123,873
Nuts (f).....	Census	.....	.....	1,949,931
Onions.....	Census	Bush.....	11,790,974	6,637,413
Orchard products.....	Census	Bush.....	212,365,600	(g) 83,750,961
Peaches and Nect.....	Census	Bush.....	15,432,603	(a)
Peanuts.....	Census	Bush.....	11,964,109	7,270,515
Pears.....	Census	Bush.....	6,625,417	(a)
Peas, dry.....	Census	Bush.....	9,440,210	7,908,966
Plums and Prunes.....	Census	Bush.....	8,764,032	(a)
Potatoes, Irish.....	1906	Bush.....	308,038,382	(h) 157,547,392
Potatoes, sweet.....	Census	Bush.....	42,517,412	19,869,840
Rice [cleaned].....	1906	Pounds.....	495,965,800	(j) 12,955,748
Seeds, Clover.....	Census	Bush.....	1,349,209	5,395,578
Seeds, Flax.....	Census	Bush.....	19,979,492	19,624,901
Seeds, Grass.....	Census	Bush.....	3,515,869	2,808,839
Sugar, Beet.....	1906	Pounds.....	967,223,040	(k) 23,895,781
Sugar, Cane.....	1906	Pounds.....	514,320,000	(k) 28,804,608
Sugar, Maple.....	Census	Pounds.....	11,928,770	1,074,260
Syrup, Cane.....	Census	Gallons.....	12,293,032	4,293,475
Syrup, Maple.....	Census	Gallons.....	2,056,611	1,562,451
Syrup, Sorghum.....	Census	Gallons.....	16,972,783	5,288,083
Tobacco.....	1906	Pounds.....	862,428,530	(h) 68,232,647
Vegetables, Mis.....	Census	.....	.....	113,644,398
Wool.....	1906	Pounds.....	298,915,130	129,410,942

(a) Included in orchard products. (b) Not including rice. (c) Based on average price paid by crushers. (d) Including value of raisins, wine, etc. (e) Including wax. (f) Not including peanuts. (g) Including value of cider, vinegar, etc. (h) December 1, 1906. (i) \$472,276,783, was the aggregate value of milk, butter and cheese by the census of 1900. (j) Value of product in 1905. (k) Value of product in 1905, based on the export value of refined. (l) Estimated 1907 corn crop 2,553,732,000 bushels.

The census of 1900 gave the following farm statistics for the United States: Farms, total number, 5,739,657; value of farm property, \$20,514,001,838; land and improvements, \$13,114,492,056; buildings, \$3,660,198,191; implements and machinery, \$761,261,550; live stock, \$3,078,050,041; expenditures in 1899 for labor, \$365,305,921; for fertilizers, \$54,783,757; number of farms operated by owners, 3,713,371; by cash tenants, 752,920; by share tenants, 1,273,366; by white persons, 4,970,129; by negroes, 746,717. Value of farm products in 1907, estimated by commissioner of agriculture, \$7,412,000,000.

total imports from Great Britain in 1907 was \$246,112,047. The international commerce of the United States is at present mainly carried in foreign bottoms, while previous to the year 1860 from 75 to 80 per cent was carried by vessels belonging to the United States. Of American vessels engaged in the foreign trade the aggregate tonnage in 1907 was 861,466; in the coasting trade, 6,010,601 tons. Including lake boats, etc., the total burden of American shipping is 6,938,794 tons. The internal commerce is largely facilitated by rivers, lakes, and canals. In 1907, 225,000 miles of railway, 265,000 miles of telegraph line, and 4,778,282 miles of telephone wire were in operation. The weights and measures are the same as those of Great Britain; but the old Winchester wine gallon, equal to .833 of an imperial gallon, the ale gallon equal to 1.01695 imperial gallon, and the Winchester bushel, equal to .9692 of an imperial bushel, are used instead of the imperial standards, and a cental of 100 lbs. is

used instead of the cwt. Accounts are kept in dollars, cents or hundredths and mills or thousandths of a dollar. The currency is partly in paper and partly in specie. Gold is coined in double eagles = 20 dollars, eagles = 10 dollars, half-eagles, quarter-eagles, and dollars. Silver is coined in dollars, half-dollars, quarters, dimes, or 10 cents, half-dimes. The only copper coins are cents. The government of the United States is a federal republic based on the constitution of 1787, drawn up by delegates from the thirteen original states, and subsequently amended. The constitution and modes of administration of the individual states bear a close resemblance to each other. Each state maintains its independence, and by means of a state legislature and executive (vested in a governor) has complete management of its own affairs. The combined states have one supreme legislature, which takes the name of congress, and consists of a senate and a house of representatives. The senate

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consists of two members from each state elected by its own legislature for six years, one-third of the whole body being renewable biennially. The house of representatives consists of members chosen for two years by the people of the several states, in numbers proportioned to their population as ascertained by the decennial census. At present it is composed of 386 members, or one member for 194,182 inhabitants. In addition to the representatives from the states, the house admits a "delegate" from each organized territory, who has the right to speak on subjects in which his territory is interested, but is not entitled to vote. The salary of a senator, representative, or delegate is \$7,500 with traveling expenses. Congress meets at least once a year, on the first Monday of December, and its leading powers are to levy taxes, duties, imposts, excises; to pay the debts and provide for the common defense and general welfare of the Union, to regulate commerce with foreign nations and among the several states, to coin money, declare war, raise and maintain an army and navy, etc. It is forbidden to the federal government, among other things, to tax exports, to grant any title of nobility, or to give commercial preference to the ports of one state over those of another. The executive is vested in a president chosen for four years, but eligible for re-election. The electors who vote for the president are chosen by each state, in such manner as its legislature may provide, and are in this capacity known as the electoral college. The president and vice-president are chosen by the majority of this college, and in the case of an equality of votes the president is chosen by the house of representatives, and the vice-president by the senate. The president, who must be a native-born citizen, and who receives a salary of \$50,000 yearly, has the power, in concurrence with two-thirds of the senate, to make treaties, appoint civil and military officers, levy war, conclude peace, etc. He has even a veto on the laws passed by congress, at least until they have received the assent of two-thirds of both houses. The vice-president, who has a salary of \$12,000 presides in the senate, and in case of death or permanent disability succeeds the president. The business of the executive is administered by the secretary of state, secretary of war, secretary of the navy, secretary of the treasury, postmaster-general, secretary of the interior, attorney-general, and secretary of agriculture, secretary of commerce and labor, each of whom has an annual salary of \$12,000 and holds office during the pleasure of the president. The judicial powers of the Union are vested in a supreme court, presided over by a chief justice and eight associate judges, which each state appoints its own local judges. The powers to enact municipal laws, that is, all laws which concern each state directly and immediately, are among the reserved rights of the state; but they cannot make treaties, coin money, impose duties, emit bills of credit, make agreements, with each other or with a foreign power, nor pass any bill impairing the

obligation of contracts. The general government derives its revenues chiefly from duties on imports and taxes on spirits, tobacco, banks, etc. In 1860 the public debt was only \$63,452,773.55; but during the civil war (1861-65) it increased to \$2,773,263,173.69. In 1906 it was \$2,429,370,043. The public revenue in 1906 amounted to \$694,621,000, the expenditure to \$460,323,000. The largest items of expenditure are pensions, the civil service, army and navy. It is enacted by congress that there shall be no more than 100,000 enlisted men at one time, the term of service being three years. The army in active service as now organized under the act of congress of February 2, 1901, comprises 15 regiments of cavalry, 750 officers and 13,020 enlisted men; an artillery corps, 30 batteries of field artillery and 126 companies of coast artillery, 651 officers and 18,166 enlisted men; 30 regiments of infantry, 1500 officers and 25,649 enlisted men; 3 battalions of engineers, 1294 enlisted men, commanded by officers detailed from the corps of engineers; staff corps, military, academy, Indian scouts, recruits, etc., 4387 enlisted men; also a provisional force consisting of one regiment in Porto Rico, 31 officers and 554 native enlisted men, and 50 companies of native scouts in the Philippines, 116 officers and about 5000 enlisted men. The total number of commissioned officers, staff and line, on the active list, is 3869, and the total enlisted strength staff and line is 62,516, exclusive of the provisional force and the hospital corps. Each state has a militia, of which the aggregate nominal strength is about 6½ millions. The navy comprises 28 first-class battle-ships, 22 coast defense ships, 50 cruisers, 42 gunboats, 57 torpedo craft, etc. In 1907 the war department expenditure was set down at \$101,671,881; that of the navy at \$97,606,595. There is, throughout the country, no uniform system of education, the organization and management of the "common" or state-supported public schools being left to each state, while considerable control is also given to the local authority. These common schools, which in rural neighborhoods are called district schools, are usually public elementary schools, but in some states they include the higher grades. To maintain these common schools the government makes no direct appropriation of moneys, this being supplied by each state through the state legislature directly, from local taxation, or from the sale of public domains set apart as a permanent school fund. Attendance on elementary schools is compulsory in many states, but not in all. In 1904-05 there was an average daily attendance of 11,481,531 pupils (out of 16,468,300 enrolled) in common schools and 350,099 in high schools. The higher education is provided in numerous colleges and universities. In addition there are special colleges for theology, law, medicine, the higher education of women, etc. The constitution of the states grants perfect equality to all creeds, and nearly all the sects and religious denominations existing in Europe are represented. In 1906 there were in all 182,731 churches belonging to the

various Protestant bodies, and 11,814 Roman Catholic churches; 140,215 Protestant ministers, and 14,104 Roman Catholic clergy. The Roman Catholics were returned at 12,651,944 in 1906, the numbers of other bodies being given as follows: Methodists, 6,429,815; Baptists, 4,974,047; Presbyterians, 1,723,871; Lutherans, 1,841,346; Protestant Episcopal, 827,127; Congregational, 687,042; Reformed church, 405,022; United Brethren, 274,012; total Protestants about 20,000,000 members or communicants. There are 300,000 Mormons and 143,000 Jews. The first English colonies within the limits of the Union were settled by two chartered companies, called the Plymouth company and the London company. By the latter an expedition was sent out in 1607, and a settlement was made at Jamestown, in the present state of Virginia, while the Plymouth company established a colony on Massachusetts bay. Other settlers continuing to arrive a colonial assembly was for the first time convened in 1619. At this time the foundation of the colonies of New England was laid by the "pilgrim fathers," a body of Puritans numbering 100 who sailed from England in the Mayflower, and landed in 1620 in Massachusetts bay, where they established themselves. Then another colony was founded in 1628 at Salem, and in 1630 still another was established in Boston. Rhode Island was first settled at Providence in 1636 by Roger Williams, who had been driven from Massachusetts for his religious and political opinions. The states of Maryland and Virginia were colonized chiefly by English Roman Catholics and royalist refugees, while the central states were, to a great extent, settled by Dutch and Swedes. But it is impossible to enter into details of the origin and progress of the different states now composing the Union. The most remarkable events of the colonial period were those connected with the wars which Great Britain and her colonies were obliged to wage with France, and which terminated in the cession of Canada, etc., to Great Britain in 1763 by the Peace of Paris at the close of the Seven Years' war. No sooner was this peace concluded than the British parliament resolved to increase the revenue by a general stamp-duty through all the American colonies. Accordingly, the Stamp Act of 1765 was passed; but this, after opposition, was repealed next year, Britain still claiming, however, its right to tax. In accordance with this claim a duty, in 1767, was imposed upon tea, paper, glass, etc.; but the colonial opposition was such that three years later the duties were all repealed except the one upon tea. To such a pass had the opposition now come that in 1773, when British ships loaded with tea attempted to effect a landing in the port of Boston, a number of the inhabitants, disguised as Indians, seized them and threw the cargoes into the sea. In punishment of this, parliament passed the Boston Port Bill, which declared that port closed to all commerce, and transferred the seat of colonial government to Salem. From this time it became evident that a conflict was inevitable, and in 1775 hos-

tilities actually commenced when a small British force, sent from Boston to destroy the military stores at Concord, was attacked by the colonists near Lexington, and forced to retreat. Before the end of April the British governor and army were besieged in Boston by a revolutionary force of 20,000 men; the northern fortresses of Ticonderoga and Crown Point were seized; and a continental congress which assembled at Philadelphia took measures to equip an army and navy, with George Washington as commander-in-chief. On June 17 the British attacked the intrenched position of the colonists on Bunker Hill, which commanded Boston harbor, and captured it, but in the following year they retreated to Halifax. This action induced the colonists to continue their resistance, and it was declared by the thirteen states assembled in congress that "the united colonies are, and ought to be, free and independent states; that their political connection with Great Britain is, and ought to be, dissolved." This resolution was embodied in a declaration of independence, drawn up by Jefferson and adopted 4th July, 1776. The British government now sent an army against the colonists under the command of Sir William Howe, and in a battle on Long Island (August, 1776) Washington was defeated with heavy loss. He retreated beyond the Delaware, and in order to defend Philadelphia, then the capital, was obliged to give battle on the Brandywine, where he was again defeated. Fortune, however, favored the Americans in the north, where General Gates at Stillwater defeated General Burgoyne. This event induced the French to enter the struggle in the spring of 1778, and subsequently Spain and Holland aided the Americans. At last the surrender of Lord Cornwallis with his army at Yorktown (1781) to a combined French and American force under Rochambeau and Washington, virtually terminated the war. On September 3, 1783, Great Britain formally recognized the independence of the United States by a treaty of peace signed at Paris, and in order still further to establish their position the states met at Philadelphia in 1787, and after four months' deliberation framed a constitution. This constitution, which remains the basis of the government, came into operation in March, 1789, and George Washington was elected the first president. The congress appointed by the thirteen states then proceeded to impose duties, establish a federal judiciary, organize the executive administration, fund the debt of the United States, and establish a national bank. In 1793 Washington was unanimously re-elected president, but in 1797 he refused to be elected for a third term. During his administration the states of Vermont, Kentucky, and Tennessee were admitted into the Union. John Adams was elected second president, and it was while he held office that France made war upon the republic, the fighting taking place chiefly at sea. In 1800 the seat of government was transferred from New York, which had at first been declared the capital, to Washington, while in 1802 Ohio and



Louisiana were added to the Union. Great Britain still claimed the allegiance of American naturalized subjects, and the right to search American vessels for British seamen. In 1807 the British frigate *Leopard* overhauled the United States frigate *Chesapeake*, near the entrance to Chesapeake bay, compelled her to surrender, and took off four of her men. Reparation was asked in vain; some time later all trade with France and England was prohibited by act of congress, and in June, 1812, war was declared against Britain. In the different engagements which took place by sea and land the success was varied, and in 1814 peace was arranged. After this the chief historical events were the wars against the southern Indian tribes and the acquisition of Florida from the Spanish in 1819; the annexation of Texas, which led to a war with Mexico in 1845 (see Mexican war); and the acquisition of New Mexico and Upper California, which were ceded to the United States on payment of the sum of \$15,000,000 to Mexico. The period about 1857 was notable for the free-soil movement and the increasing difficulty of dealing with slavery. Texas had been introduced into the Union as a slave-holding state, and the endeavor to act similarly with regard to the territory of Kansas led to rioting. The question was still further complicated by disputes respecting the territory of Nebraska, and the insurrection (1859) at Harper's Ferry, led by John Brown, brought the question of the abolition of slavery to a crisis. The presidential election of 1860 turned to a great extent upon this question, and when, Abraham Lincoln, the republican candidate, was elected the slave-holding states considered themselves defeated, and South Carolina, Mississippi, Florida, Alabama, Georgia, Louisiana, and Texas formally seceded from the Union. These states formed themselves into a southern confederation (4th February, 1861), with Jefferson Davis as president, and they were subsequently joined, after hostilities had begun, by Virginia, North Carolina, Tennessee and Arkansas. The custom-houses, arsenals, and United States buildings generally were seized and occupied by the confederates in their own states, and every preparation made to organize a separate government. War was inevitable, and the first blow was struck on April 12, 1861, the confederates proceeding to bombard Fort Sumter, which was forced to surrender. President Lincoln then called out by proclamation 75,000 volunteers, and the first battle on a large scale took place at Bull Run, south of Washington, where the federal forces were completely defeated. During the remainder of 1861 frequent collision took place between the rival forces at different points, almost always to the disadvantage of the north. In the spring of 1862 General Grant captured Fort Donnellson, on the Cumberland river, and along with General Sherman obtained a victory over the confederates at Pittsburg Landing, in Tennessee. In April the federal fleet, under Admiral Farragut, ran past the forts at the entrance of the Mississippi, and seized New Orleans,

which was occupied by the supporting land forces. An attempt was then made by General McClellan to invest Richmond, the capital of the confederacy, but this was prevented by the confederate generals Lee and "Stonewall" Jackson, who drove back the federals on the James river, where they established themselves. General Lee then assumed the offensive and moved with his whole army upon Washington, but he was intercepted on the banks of the Antietam by McClellan, and, after an obstinate fight, compelled to recross the Potomac. Soon afterward McClellan was superseded by Burnside, and in December another advance to Richmond was commenced. This General Lee had anticipated, and intrenched himself behind the town of Fredericksburg, a position from which the federals vainly endeavored to dislodge him. Thus the year 1862 closed with no great gain on either side. In the following April General Hooker, superseding Burnside in the command of the army of the Potomac, commenced another movement toward Richmond, but was defeated by "Stonewall" Jackson at Chancellorsville, where, by mischance, the latter was killed in the darkness by his own men. Following up this gain General Lee transferred his army to the valley of the Shenandoah, entered Maryland, and crossed into Pennsylvania. At Gettysburg he was obliged to turn upon the pursuing federal forces under Meade, and after three days' desperate fighting and the loss of 15,000 men Lee was forced to retreat into Virginia. On the Mississippi the fortune of war was also in favor of the federals. Aided by the fleet, which had dashed past Port Hudson and seized Natchez, General Grant had assumed the offensive and captured Vicksburg, while at the end of this year (1863) he inflicted severe defeat upon Bragg at Chattanooga. In 1864 General Grant, as the result of his successes, was appointed commander-in-chief of all the armies, and at once he set himself to reorganize the federal forces. He took command of the army of the Potomac himself, with which he proposed to meet Lee, while he dispatched Sherman to operate against J. E. Johnston. In May, Grant moved his main force across the Rapidan and immediately attacked Lee in The Wilderness, where severe fighting lasted for six consecutive days. Unable to rout the confederates, Grant endeavored by a flank movement to cut them off from Richmond, but Lee anticipated the attempt and foiled it. Thus baffled, Grant by a circuit crossed the James river, joined Butler, and attacked Petersburg, but was repelled, and obliged to begin a regular siege during the winter. Meantime Sherman with a large federal force, had defeated Hood (who superseded Johnston as commander in Georgia), had occupied Atlanta, crossed the country by forced marches, seized Savannah, and by February, 1865, was able to occupy Charleston and Wilmington. During this brilliant movement the forces under Lee and Grant had faced each other in the lines round Richmond, but in April, 1865, a general advance was made by the federals. Lee

defended Petersburg and Richmond with great skill and obstinacy, but after three days' sanguinary conflict the confederate lines were broken, and Richmond lay at the mercy of the Northern armies. Lee retreated north of the Appomattox, but was closely followed by Grant, who captured the general and his whole army. The remaining confederate armies in the field soon afterward surrendered, and the four years' war ended in favor of the federal government. In the course of the war the abolition of slavery had been proclaimed by President Lincoln, and he had just entered (April 1865) upon his second term of the presidency when he was assassinated in Ford's theater at Washington by J. Wilkes Booth.

As the states returned to their allegiance to the Union they were after a time readmitted to their state and national privileges. The election of General Grant to the presidency in 1869 served, in some measure, to consolidate matters. An amendment to the national constitution was proclaimed in March 1870, and provided that no difference of race, color, education, or religion shall debar any person from the rights of citizenship in any of the states. This question of equal rights gave rise in 1874 to considerable rioting in the southern states between the negro and the white population, and is still beset with dangers. During the Grant administration the Indians of the northwest frontier were successfully suppressed, and a bill for the resumption of cash payments on January 1, 1879, passed Congress (December, 1874). Among other events were the admission of Colorado (1876) to the Union; the great international exhibition at Philadelphia, to celebrate the centenary of American Independence (1876); the opening of the Pacific railway from Omaha to San Francisco (1869); a dispute with Spain respecting the imprisonment of an American citizen in Cuba (1870-72); the great labor strike at New York (June, 1872); the massacre of General Custer and troops by the Indians (June 25, 1876); the celebration of the foundation of the American republic (July 4, 1876); and the settlement of the dispute with Great Britain respecting extradition (December, 1876). The election for president at the close of 1876 resulted in the return of Rutherford B. Hayes (1877-81), republican, the principal events in his term of office being the dispute as to the validity of the presidential election; the great railway strike; riots and bloodshed in West Virginia (July, 1877), suppressed by General Sheridan; the progress of measures for the pacification of the south; the veto of the Bland "Silver Bill" by the president (February 16, 1878), after it had received the sanction of congress, and the resumption of cash payments (January 1, 1879), gold for the first time since the war being at par (December 18, 1878). General J. A. Garfield (1881), republican, succeeded as president, but held office but for a short period, dying from the effects of a bullet fired by Guiteau, a Chicago lawyer (July 2, 1881). General Chester A. Arthur (1881-85), the vice-president, became president, and was succeeded

by Grover Cleveland (1885-89), the democrats, for the first time since the presidency of Buchanan, being successful in placing their nominee in office. President Cleveland's term of office was characterized by the adoption of measures for the reorganization of the civil service, and other reforms. Among the events of this presidency were the rejection, by the republicans, of the Fisheries Treaty, arranged with the United States government by Mr. Joseph Chamberlain on behalf of Great Britain, after having received the sanction of the president; the passage by congress of a bill prohibiting Chinese immigration for twenty years; the great blizzard which devastated New York (March 12, 1888); the collapse of the great railway strike organized by the Knights of Labor; the defeat of the Mills Tariff bill, introduced to reduce import duties, and the withdrawal of Lord Sackville, the British ambassador, in consequence of the "Murchison" letter. General Sheridan, commander-in-chief of the United States army, died July, 1888. In the election (November, 1888), the republicans replaced Cleveland by their candidate, General Harrison (1889), who appointed Mr. J. G. Blaine as secretary of state. North and South Dakota, Montana, and Washington territory were admitted to the Union. The same year the United States government accepted Prince Bismarck's proposal to join the Berlin conference on the Samoan question (the treaty was ratified February, 1890); the Oklahoma territory was thrown open for settlement; the centennial of the Union was celebrated on May Day; the agents of the Clan-na-Gael, who had assassinated Dr. Cronin of Chicago, were tried. Great floods at Johnstown, Pa., caused much destruction and distress (May), and later (November), New York state, Pennsylvania, and neighboring states were devastated by floods. A great Pan-American congress assembled (November) at Philadelphia, under the presidency of Mr. Blaine, and (December 6) Jefferson Davis, ex-president of the confederate states, died at New Orleans. 1890 was chiefly remarkable for the passage of the Silver bill, authorizing the secretary of the treasury to purchase for coining 4,500,000 oz. of silver monthly, and to issue certificates to be used as legal tender for all debts; the passage of the McKinley Tariff bill, which greatly augmented the import duties, the bill coming into operation October 6; the ratification of a new Extradition Treaty with Great Britain; the passage of a bill for increasing the United States navy, and the defeat of the republican party by large majorities at the general elections (November). The attitude of Mr. Reed, speaker of the house of representatives, toward the democratic members caused considerable friction in that party. Wyoming and Idaho were this year admitted to the Union. The principal events of 1891 were the continuation of the Fisheries dispute; the passage of the Copyright bill; the lynching of the Italian prisoners connected with the Mafia by the citizens of New Orleans (March), and the recall of the Italian ambassador; the refusal of

the Chinese court to receive the United States representative, as a protest against the Chinese Immigration bill; the tour of the president through the south and west of the states; and the agreement between the United States and Great Britain, signed at Washington. In 1892 the Fisheries Dispute was agreed to be referred to arbitration; compensation to the families of the Italians lynched at New Orleans was granted by the United States government; more stringent measures adopted for the exclusion of the Chinese, and the presidential contest commenced. The political change in 1893 in the Washington administration by the inauguration of Mr. Cleveland as president on March 4 did not cause as much excitement as did Mr. Cleveland's first accession. President Cleveland called an extra session of congress to convene August 7, to consider the financial crisis June 30; when the extra session begun currency was selling at a premium in New York City. The house of representatives voted to repeal the silver-purchasing clause of the Sherman act, rejecting all free coinage amendments, August 28, and on September 20 the bill to repeal the Federal Election law was reported in the house. The senate passed the Silver Repeal bill October 30. During the year American eyes were turned frequently toward Hawaii, where Queen Liliuokalani was dethroned by revolutionists on January 16; Minister Stevens landed United States marines at Honolulu, raised the United States flag, and established a protectorate February 1; this protectorate ended April 13, when the United States forces were withdrawn by order of Commissioner Blount. Other noteworthy American incidents of 1893 were: The World's Fair at Chicago was opened by President Cleveland May 1 and continued until October 30; the New York Central railroad's engine "999" raised the speed limit to 112½ miles per hour; Princess Eulalie, representative of the Spanish government, was received with honors in New York May 18; the body of Jefferson Davis was reinterred at Richmond, Va.; Lieutenant Peary's expedition left New York for the Arctic regions July 2; 1,000 lives were lost by a cyclone in Savannah and Charleston August 28; President Cleveland opened the Pan-American congress in Washington September 5; the Parliament of Religions began its sessions at Chicago September 11; the Cherokee strip was opened for public settlement September 16; a disastrous cyclone raged on the Gulf coast of Louisiana, about 2,000 persons, mostly whites, being killed, and much property destroyed; the United States supreme court decided the Great Lakes to be high seas November 21. The principal events of interest in 1894 included the passing of the Wilson Tariff and Income Tax bills by the house of representatives; the passing of the Bland Coinage bill by the United States senate, 44 to 31; the Greater New York bill was signed by the governor, making it the second largest city on earth, February 28; President Cleveland signed the Enabling act, making Utah a state, July 17; the Hawaiian republic was

officially recognized by the United States government August 9; the new tariff law became a law without President Cleveland's signature August 27; a new treaty between the United States and Japan was proclaimed December 9. President Cleveland, on January 28, 1895, sent a message to congress on the financial affairs of the government, and asked authority to issue gold bonds; on February 8 he informed congress of arrangements made with the bankers' syndicate to take an issue of \$62,400,000 government bonds. On May 20, the supreme court of the United States, by a vote of 5 to 4, declared the whole Income tax law null and void. The Cotton States and International exposition at Atlanta was opened. The National park, on the site of the Chickamauga battle ground, Tennessee, was dedicated by a great gathering of Union and confederate veterans September 19. In 1896 McKinley won a signal victory, receiving 601,854 popular votes over Bryan and 286,452 over all. The final year of President Cleveland's administration was marked by his announcement of the members of the Venezuelan Boundary commission January 1; a call by Secretary Carlisle, January 6, for bids for \$100,000,000 bonds as a popular loan; the president's proclamation of warning to Cuban filibusters July 30; the reception of Li Hung Chang, the Chinese statesman, by president Cleveland August 29. In 1897 McKinley was inaugurated. Previous to that, a treaty of arbitration between the United States and Great Britain was signed at Washington by Secretary Olney and Ambassador Pauncefoot January 11. The Tennessee Centennial exposition was formally opened May 1. The Congress of the Universal Postal Union opened at Washington, D. C., May 2. The Venezuela Boundary treaty between Great Britain and Venezuela was ratified at Washington June 14. A treaty of annexation to the United States was unanimously ratified by the Hawaiian senate September 14. Secretary of State Sherman and Lord Salisbury, British Foreign Minister, held correspondence over the Bering sea seal question October 4-12. A treaty to protect the seals in Bering sea was signed at Washington by representatives of the United States, Russia and Japan. President McKinley signed the treaty adopted by the Universal Postal Congress November 16. The destruction of the battleship Maine, in the harbor of Havana, February 15, 1898, would have precipitated a crisis had it not been for the fact that the question was immediately raised as to whether the ship had been destroyed by an external or internal explosion. The disaster caused intense excitement, and it was decided to investigate the facts, and await material proof before forming a judgment as to the cause, the responsibility, and, if the facts warranted, the remedy due. A naval court of inquiry was organized. The court held its sittings on board the lighthouse tender Mangrove anchored near the wreck. Aided by a strong force of wreckers and divers, the court proceeded to make a thorough investigation. The finding of the court of

inquiry was reached, on the 21st of March, and, having been approved on the day following by the commander-in-chief of the United States naval force on the north Atlantic station, was transmitted to President McKinley. This report was submitted to congress by the president, with the statement that he did not doubt but that the sense of justice of the Spanish nation would dictate a course of action suggested by honor and the friendly relations of the two governments. On March 8 the house of representatives passed a bill appropriating \$50,000,000 for national defense, after four hours of debate, by the unanimous vote of 311 members. The following day the senate passed the same bill by a unanimous vote and without debate. On March 9 the president signed the bill, and measures of preparation for war received a great stimulus. On April 15, the Twenty-fifth infantry, United States of America, went into camp at Chickamauga Park. The following day the army officials called for bids for the transportation of troops to southern points. United States troops from many garrisons, on April 19, moved to the point of mobilization on the Gulf and at Chickamauga Park. On April 20, the president sent an ultimatum to Spain demanding that her land and naval forces withdraw from Cuba, and also required an answer before noon of April 23. The Spanish minister at Washington requested and received his passports. Before Minister Woodford could deliver the ultimatum of the United States to Spain on the day following, he was notified by the Spanish government that diplomatic relations with the United States were at an end. On April 22, the Spanish merchantman Buenaventura was captured by the United States gunboat Nashville off Key West. Spain issued a declaration of war on April 24. On the day preceding, the blockading of Havana and neighboring ports actually began, and President McKinley issued his first call for 125,000 volunteers. The regular army was already moving from every post in the country to mobilization points. Commodore Dewey at Hongkong was ordered to capture or destroy the Spanish naval forces in the Philippine Islands. May 1, Commodore Dewey, steamed into Manila harbor, and after an incredibly short engagement sunk or destroyed the entire Spanish fleet. On the following day Commodore Dewey cut the cable connecting Manila with Hongkong, and destroyed the fortifications at the entrance of Manila Bay, taking possession of the naval station at Cavite. May 12, Admiral Sampson bombarded San Juan, Porto Rico. Cervera left the Cape Verde Islands, where he had congregated the best ships of the Spanish navy, and sailed westward. May 13, Schley's flying squadron went to sea to search for the Spanish fleet. It was located a few days later at Curacoa, Venezuela, where it touched for coal and repairs. On May 18, Cervera's fleet reached Santiago and entered the harbor. Investment of the harbor by the North Atlantic and the flying squadrons was immediately begun; also bombardment of the outer fortifications of the place, which were supposed to be

very strong. On June 1, the fleets of Sampson and Schley were combined, Admiral Sampson commanding. While the navy was locating Cervera and penning him in, the army was landing supplies on Cuban soil. Next came preparations for hurrying forward into Cuba an army of invasion. May 25, President McKinley called for 75,000 more troops. The same day the war department sent 6,000 troops from San Francisco to Manila to reinforce Dewey. General Shafter and his men commenced fighting two days after touching Cuban soil. On June 24 they took Juragua. At the same time the United States "Rough Riders" (dismounted), under Colonel Wood and Lieutenant-Colonel Theodore Roosevelt, engaged a force of Spaniards near Siboney and suffered severely. The Tenth United States cavalry, under General Young, was also in this battle. On July 3, General Shafter notified the Spanish generals in Santiago that if surrender were not immediate he would bombard the city. While General Shafter was waiting for a reply to his notice of bombardment, Admiral Cervera, attempted on the morning of July 3 to escape from the harbor of Santiago. The American ships got under headway at once, and bore down upon the enemy, forcing the Spanish ships to hug the shore, and in an incredibly short time in a running fight the whole of Cervera's fleet was destroyed. Owing to advices from Washington, Shafter did not bombard Santiago as he had threatened, but besieged the city. July 10, Spanish batteries opened on his forces, but were soon silenced. General Toral, the Spanish general commanding at Santiago, decided, July 14, to surrender, and three days later he gave up the city and the entire eastern portion of Cuba, together with 25,000 soldiers. With the surrender of Santiago the war was thought by all to be practically at an end, but active preparations were continued to take possession of Porto Rico. General Miles was placed in command of an army of invasion, which landed July 20, at Port Guianca. The Spaniards there resisted, but were repulsed, and the army advanced. The port of Ponce was occupied without difficulty, and then the city of Ponce and Juana Diaz. The advance upon San Juan was gradual, the Spanish resistance was very light, while the inhabitants welcomed the invading army with enthusiasm. Porto Rico was evacuated by the Spanish soldiers in October, and Major-General John R. Brook was appointed military governor. The members of the old cabinet of the islands took the oath of allegiance to the United States, and were continued in office. In December General Brook became military governor of Cuba, and General Guy V. Henry succeeded him in Porto Rico. Affairs in the Philippines assumed a serious nature soon after the capture of Manila, August 13, 1898. The Filipinos organized a provisional government with Emilio Aguinaldo at the head. This leader had been brought in an American ship from Hongkong to organize the native forces to assist the United States against the Spanish. In a few months' operations the native troops captured many

Spanish outposts and took many prisoners. At the close of the war the existence of the Filipino republic was made known, and its officers demanded recognition by the United States government, and upon being refused, showed considerable animosity during the winter of 1898-99. In February, 1899, a battle occurred between the Filipinos about Manila and the American troops stationed between them and the city to prevent their entrance into Manila. Thus was begun a conflict which lasted throughout 1899, 1900, and until March, 1901, when Aguinaldo was captured by General Funston. (See Spanish-American War). The other events of interest were: the United States and Canadian Joint High commission met at Quebec August 23; a commercial treaty with France was signed at Washington May 30; the Trans-Mississippi and International exposition opened at Omaha, Neb., June 1; a joint resolution for the annexation of Hawaii passed the house of representatives June 15, and the senate June 17; President McKinley and his cabinet attended the Peace Jubilee at Atlanta, and visited Montgomery, Savannah and other southern cities, receiving great ovations, December 13-19.

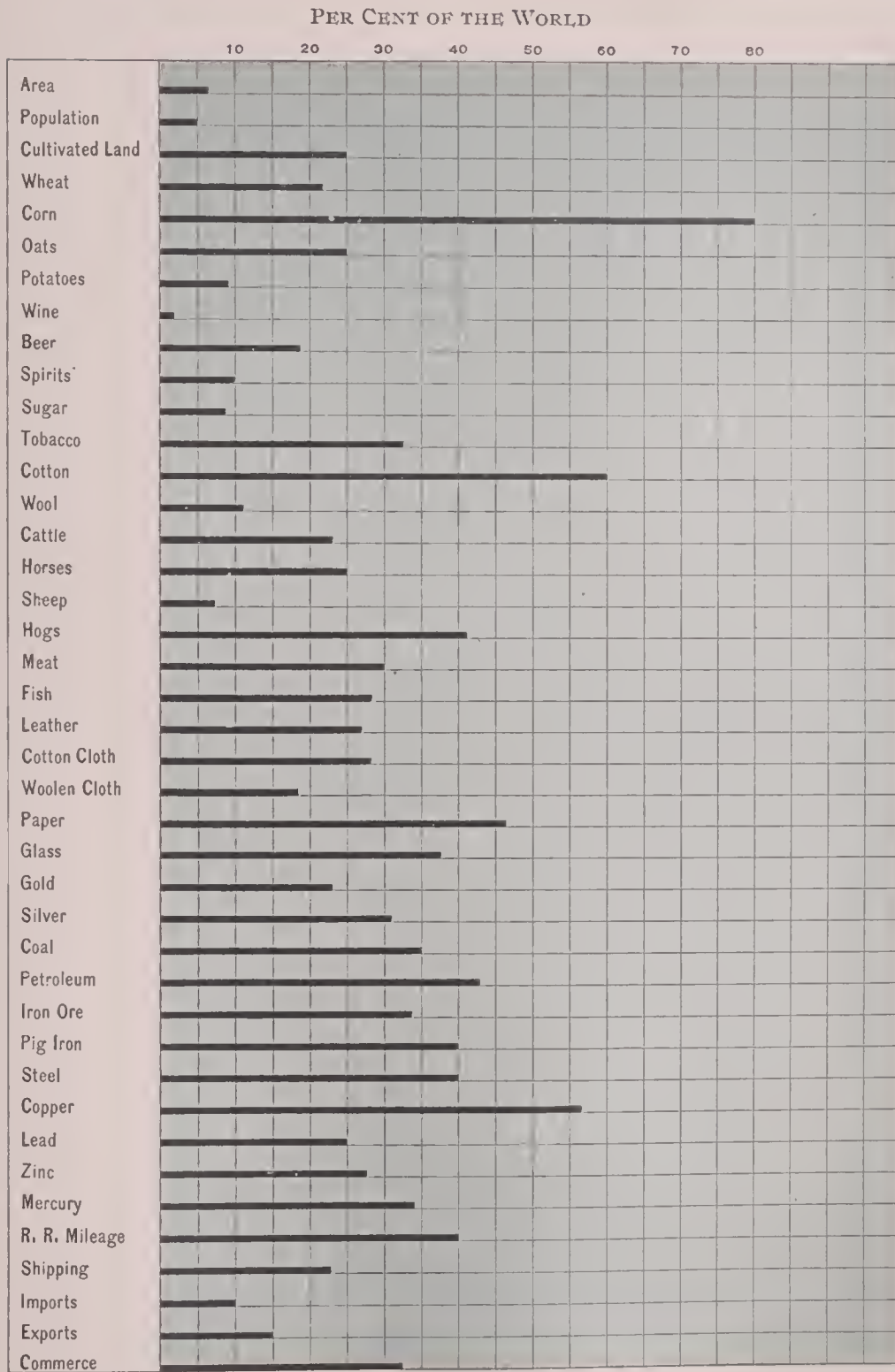
The calm of peace settled upon the United States, except in the Philippines, in 1899. The American flag was raised at Guam February 1. The president signed the peace treaty with Spain February 10. A reciprocity treaty with France was signed July 24. The National Export exposition opened at Philadelphia September 14. England and the United States agreed on a temporary arrangement of the Alaska boundary dispute October 12. The Samoan partition treaty was signed at Washington December 2, England having relinquished its territorial rights November 8, and hostilities between naval claimants for the throne having been pending since January 1. American and British naval forces were attacked at Apia, Samoa, by Mataafa's followers April 1, and one British and two American officers were killed. The Philippine war of 1899 began on February 4, when the Filipinos, under Aguinaldo, attacked the American defenses at Manila; the next day the Americans assumed the offensive, and in the several days' fighting which ensued lost 57 killed and 215 wounded, the Filipinos losing 500 killed, 1,000 wounded and 500 captured. The battle of Calocan was fought February 10. In all the engagements, which followed to the end of the year in a warfare largely desultory, the Americans were almost uniformly successful, the enemy retreating after making a more or less determined stand. The Philippine commission, appointed by the president, and composed of President Schurman, of Cornell university; Prof. Dean Worcester, Charles Denby, late minister to China; Admiral Dewey and General Otis sat in Manila from March 20 until September. On April 4 the commission issued a proclamation to the people of the Philippines announcing a broad but firm American policy in the islands. On November 2 the commission submitted its preliminary report to the president at

Washington. The army of occupation having been reinforced by 30,000 men, military operations on a much larger scale than before were begun with the advance of the dry season. In 1900 Secretary Hay announced the success of the "open door" policy in China; the senate ratified the Samoan treaty January 16; the Hay-Pauncefote treaty, amending the Clayton-Bulwer treaty, was signed at Washington February 5; President McKinley signed the Gold Standard Currency bill March 14; a tornado at Galveston, Tex., destroyed 7000 lives and \$30,000,000 in property September 8, and about \$1,000,000 was subscribed throughout the states for relief; a great strike prevailed in the anthracite coal regions of Pennsylvania September 13-October 13, and was ended by mutual concessions; the republican national convention at Philadelphia, Pa., nominated William McKinley, of Ohio, for president, and Theodore Roosevelt, of New York, for vice-president, both by acclamation. The democratic national convention at Kansas City, Mo., nominated William J. Bryan for president by acclamation. On the first ballot Adlai E. Stevenson for vice-president, his leading opponent being David B. Hill, who received 200 votes out of 936 cast, Stevenson getting 559½ ballots. The silver republican national convention at Kansas City, Mo., July 6, the people's party (fusion) at Sioux Falls, S. Dak., May 10, and the anti-imperialist league at Indianapolis, Ind., August 16, indorsed Bryan, and the national democratic party (gold democracy) refused to indorse him, and voted in convention at Indianapolis to oppose him July 25. The money issue was paramount in the campaign, and on November 6, in the general election, McKinley and Roosevelt had a popular plurality of 849,435 over Bryan, a popular majority of 457,027 over all, and an electoral majority of 137. The total popular vote was 13,961,566. In 1901 President McKinley, while holding a reception, on September 6, at the Pan-American exposition, Buffalo, was shot by Leon Czolgosz. Vice-President Theodore Roosevelt took the oath of office as president immediately after McKinley's death. The Army Reorganization bill was signed by President McKinley February 2; territorial legislature of Hawaii began its session February 20; Aguinaldo, the Filipino insurrectionary chief, was captured by General Funston in the Province of Isabella, Luzon, March 23; on the same date the United States paid Spain for the islands of Cagayan and Sibutu; President McKinley received the Cuban commissioners April 26; the Pan-American exposition was formally opened at Buffalo, N. Y., May 1; it was closed November 4; civil government was established at Manila, in the Philippines, May 3; Jacksonville, Fla., suffered a \$10,000,000 fire May 3; the Isthmian Canal Treaty between the United States and Great Britain was signed by Secretary Hay and Lord Pauncefote November 8; the South Carolina and West Indian Exposition at Charleston, S. C., was opened with religious ceremonies December 1. In 1902 President Roosevelt sent to

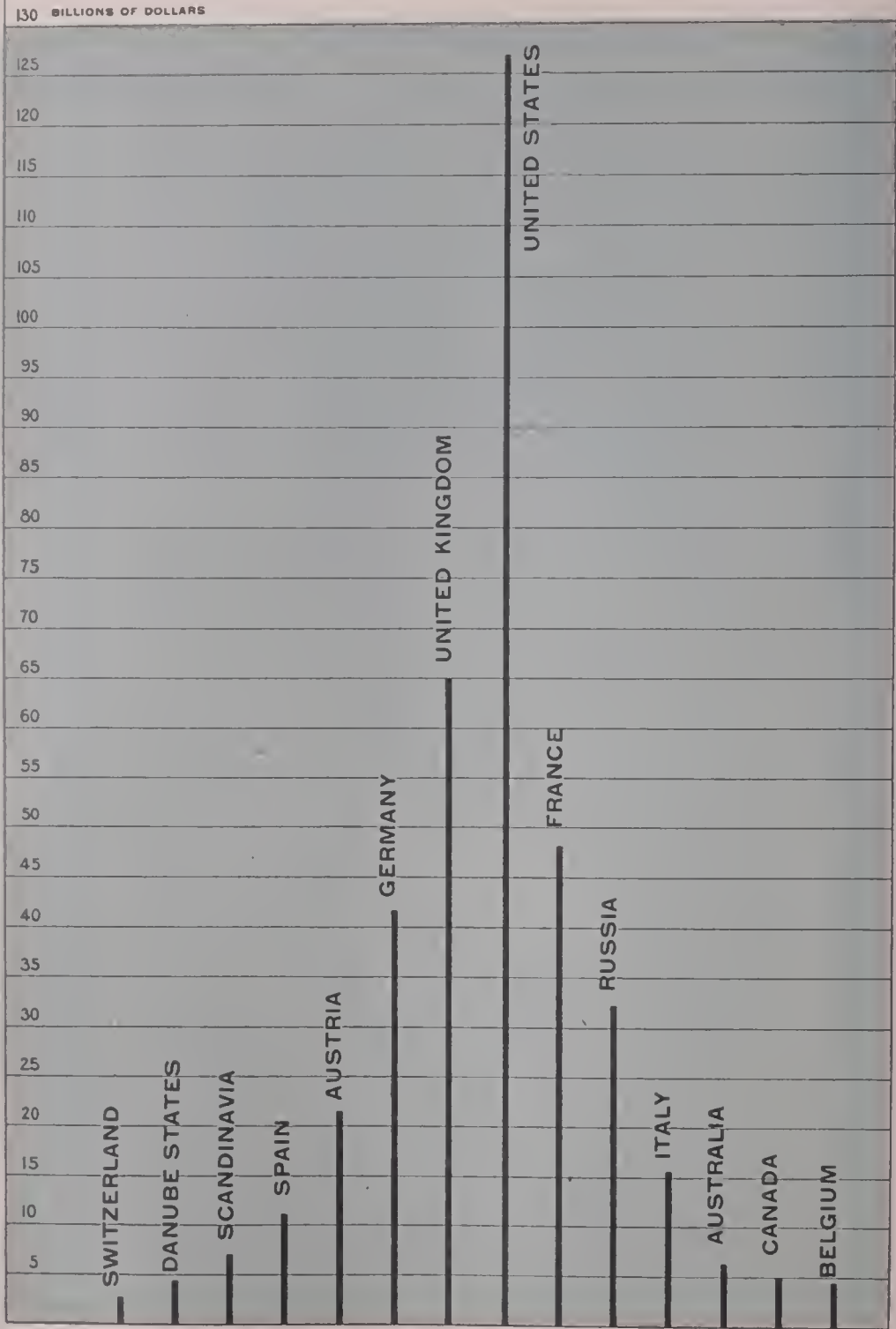
congress the report of the Isthmian Canal commission, recommending the purchase of the Panama Canal company rights for \$40,000,000. On July 4 he issued orders establishing civil government in the Philippines and granting amnesty for political prisoners. A great strike of anthracite coal workers in the Pennsylvania region begun May 12. Lieutenant Peary, American Arctic explorer, arrived at Sydney, C. B., having penetrated as far north as 84° 17' northwest of Cape Hecla; the reciprocity treaty between the United States and Newfoundland was signed November 8. The Venezuelan government appealed, through the United States, for arbitration of European claims December 15. The Panama Canal treaty between the United States and Colombia was signed January 22, 1903; the United States and Great Britain signed a treaty providing for a mixed commission to settle the Alaskan boundary dispute January 24; Great Britain, Germany and Italy signed February 13, protocols providing for the settlement of the Venezuelan controversy at Washington, and protocols for the settlement of the French, Mexican and Dutch claims against Venezuela were signed at Washington February 26-28; the president signed the bill creating the department of commerce and labor February 14; the Cuban senate ratified the reciprocity treaty with the United States March 11, and it was ratified at Washington, with amendments March 19; President Roosevelt started on an extensive western trip April 1; the United States court of appeals decided the Northern Securities company merger illegal April 9; the United States supreme court sustained the clause in the Alabama constitution disfranchising the negroes April 27; the dedication of the Louisiana Purchase exposition buildings at St. Louis took place with imposing ceremonies April 30; the European Squadron of the United States arrived at Kiel and was received by the German Emperor June 23-26; Cuba ceded to the United States two naval stations, and government of the Isle of Pines was settled July 2; the Pacific cable was completed, and on July 4 President Roosevelt sent the first message over to Governor Taft, of the Philippines; the President sent another message around the world by cable in twelve minutes; Chicago celebrated the hundredth anniversary of the first settlement September 26-October 1; a commercial treaty between the United States and China was signed October 8; the Alaskan Boundary Tribunal in London decided in favor of the United States on all points except the Portland canal October 17; the republic of Panama was proclaimed November 3, and the United States recognized the independence of Panama November 6; congress met in extraordinary session to consider the Cuban reciprocity treaty November 9; the Cuban naval station at Guantanamo was transferred to the United States November 11; the House of representatives passed the Cuban Reciprocity bill November 19. The republican national convention met at Chicago, June 23, 1904, and nominated Theodore Roosevelt, of New York, for

president, and Charles W. Fairbanks, of Indiana, for vice-president. The democratic national convention at St. Louis nominated Alton B. Parker, of New York, for president, and Henry G. Davis, of West Virginia, for vice-president. Roosevelt had a "walk over," receiving 2,541,635 popular votes to Parker's 1,729,809. The United States supreme court decided that Porto Ricans are not aliens, January 4; the commercial treaty between the United States and China was ratified at Washington, President Roosevelt issuing a proclamation to that effect January 13; William H. Taft became secretary of war, Elihu Root retiring, February 1; fire in Baltimore's business district destroyed \$70,000,000 worth of property; senate ratified the Panama canal treaty by a vote of 66 to 14 February 23; one of the tunnels under the Hudson, between New Jersey and New York, was completed March 11; the United States supreme court decided that the Northern Securities company was a trust, and therefore, illegal, March 14; the United States senate, in executive session, ratified the treaty with Cuba, embodying the Platt amendment, March 22; the contract for the transfer of the Panama Canal property to the United States was signed at Paris April 22; the Louisiana Purchase exposition was opened at St. Louis April 30; the excursion steamer General Slocum, having on board a Sunday-school picnic, was burned in the East river and more than 1000 persons, mainly women and children, were lost June 15; the thirteenth International Peace conference opened at Boston October 3; the president directed Secretary Taft to go to Panama to reassure the people of the pacific intentions of the United States October 19; the president invited the signatory powers to a second peace conference at The Hague October 20; the New York subway was opened from city hall to 145th street October 27; Secretary of State Hay and the French ambassador signed an arbitration treaty at Washington, D. C., November 1; an arbitration treaty was signed at Washington between Germany and the United States November 15; all differences between the United States and Panama were settled by an agreement between Secretary Taft and President Amador December 2. In 1905 through the efforts of President Roosevelt, Russia and Japan agreed to a peace parley in June. On January 28 Santo Domingo agreed that the United States should preserve order and assume charge of finances in the Dominican republic, while guaranteeing territorial integrity. Theodore Roosevelt and Charles W. Fairbanks were inaugurated on March 4 as president and vice-president of the United States for the term 1905-1909; the United States supreme court declared the beef trust illegal January 30; the investigation into the affairs of life insurance companies in New York began, the Equitable being the first company investigated; the body of John Paul Jones was discovered in Paris by Gen. Horace Porter April 14; it was brought with honors to the United States and was interred in a temporary tomb at Annap-

SHARE OF THE UNITED STATES IN THE WORLDS PRODUCTS.



AGGREGATE WEALTH OF THE PEOPLE OF
VARIOUS NATIONS



olis, Md., July 24; the Lewis and Clarke Centennial exposition was opened at Portland, Ore., May 28; Charles J. Bonaparte succeeded Paul Morton as secretary of the navy July 1; Elihu Root was appointed to succeed the late John Hay as secretary of state July 6; Peary sailed from New York for the North Pole July 16; Prince Louis of Battenburg arrived at Annapolis with the British cruiser squadron on a visit to American waters November 1. In 1906 the United States supreme court decided that witnesses in anti-trust proceedings cannot be excused from testifying against their corporation March 12; earthquakes and fire destroyed a large part of San Francisco, Cal., causing a loss of \$400,000,000, April 18-19; the remains of John Paul Jones were reinterred at Annapolis April 24; the Benjamin Franklin Bi-Centenary was celebrated at Philadelphia April 27; public schools, with half a million pupils, were opened in the Philippines June 11; the president signed the Oklahoma and Arizona statehood bills June 16; the United States senate approved of the lock canal for Panama June 21; an insurrectionary movement in Cuba was begun August 20, and President Palma appealed to the United States for intervention in the island September 8; on September 13 American marines were landed at Havana, but were withdrawn; on September 28 President Palma, of Cuba, resigned; on the following day Secretary Taft proclaimed United States intervention in Cuba and himself as provisional governor; on October 12 Mr. Taft was succeeded in this office by Charles E. Magoon; William J. Bryan arrived in New York city from a long trip abroad and was given a popular reception August 30; a great naval demonstration off Oyster Bay was reviewed by the president September 8; Gen. James F. Smith was installed as governor of the Philippine islands September 20; the sugar trust was indicted at New York for accepting railroad rebates October 2; contractors were invited to submit proposals for the completion of the Panama canal September 10; the Japanese were excluded from the regular public schools of San Francisco October 15; President Roosevelt departed on a visit to the Isthmus of Panama November 8, reaching the city of Panama November 15, this being the first time a president of the United States passed beyond the jurisdiction of its flag. The president landed in Porto Rico November 21, and returned thence to Washington, where he arrived November 26. In 1907 the pure food law went into effect January 1. Ambassador Bryce presented his credentials at the White House February 25. Major Gonthals was appointed chief engineer of the Panama canal February 26. The United States supreme court decided that the Isle of Pines is not American territory, April 8. The Jamestown Tercentenary exposition was formally opened by President Roosevelt April 26. President Roosevelt signed a treaty with San Domingo June 24. United States fiscal year closed with a surplus of \$87,000,000 June 30. The north tube of the Belmont tunnel from 42d street,

New York, to Long Island City was opened August 7. Oklahoma ratified the new constitution and elected a Democratic state ticket and legislature September 17. The Philippine assembly was opened October 16. First wireless dispatch over the Atlantic ocean for commercial purposes October 17. Financial stringency all over the country. Wm. H. Taft and James Schoolcraft Sherman were elected as president and vice president. Opened the Central American Peace conference November 17. American battleship fleet departed for the Pacific coast Dec. 16, 1908 visiting Hawaii, Australia, the Philippines, Japan, China and Gibraltar, arriving in Hampton Roads in February, 1909, without a mishap.

The first literary work of any consequence produced in the United States was a translation of Ovid's *Metamorphoses* by George Sandys, written in Virginia (1620) and published in London (1626), and the first published book was a Puritan edition of the *Psalms* (Cambridge, United States, 1640). The most notable of the earlier writers were the theologians, such as Increase and Cotton Mather, Roger Williams, and above all Jonathan Edwards. The succeeding or revolutionary era was chiefly remarkable for its political writers, among whom were John Adams, Thomas Jefferson, Alexander Hamilton, John Jay, James Madison, and Benjamin Franklin. Philology was represented at this time by Lindley Murray, and the compiler of the famous dictionary Noah Webster. The list of poets includes Philip Freneau, John Trumbull and Joel Barlow. The first well-known novelist was Chas. Brockden Brown.

It was not, however, till the nineteenth century that the United States produced the higher form of pure literature. The poets of this epoch were William Cullen Bryant, Rich. H. Dana, J. G. Percival, Fitz-Greene Halleck, and Mrs. Sigourney, the song-writers, F. S. Key, Sam. Woodworth, John H. Payne (author of *Home, Sweet Home*), and Stephen C. Foster. The later and in part more famous names are J. G. Whittier, H. W. Longfellow, E. A. Poe, James R. Lowell, R. W. Emerson, Walt Whitman, Eugene Field, and James Whitcomb Riley; less well known throughout the world with many strong followings in varied classes are R. H. Stoddard, E. C. Stedman, Joaquin Miller, Will Carleton, Ella Wheeler Wilcox, Bliss Carmen, Clinton Scollard and William Vaughn Moody. The famous novelists of the past are James Fenimore Cooper and Harriet Beecher Stowe, the works of these two having been translated into all the modern languages; Washington Irving, Nathaniel Hawthorne and Bret Harte; nearly as well known are Henry James, F. R. Stockton, Louisa M. Alcott, and G. W. Cable; among the better known names of the present generation are Margaret Deland, Edith Wharton, Robert Barr, and R. W. Chambers, while the works of Mary Hartwell Catherwood, Frances Hodgson Burnett, Winston Churchill, F. Marion Crawford, Booth Tarkington, Mary Johnston, Irving Bacheller, and Maurice Thompson won enormous popularity.

Of the poets Edgar Allen Poe is as well known for his fiction; Holmes, Longfellow, and Whittier are also authors of novels. Of American humorists the best known are Charles F. Browne (Artemus Ward), Samuel L. Clemens (Mark Twain), C. H. Clark (Max Adeler), H. W. Shaw (Josh Billings), E. W. Nye (Bill Nye), F. P. Dunne (Mr. Dooley), and George Ade. Among leading American historians are George Bancroft, W. H. Prescott, J. L. Motley, J. B. McMaster, and Woodrow Wilson, whose work represented much original research while a school of "popular" historical writing was developed by J. C. Ridpath and others. At the head of the essayists stand Ralph Waldo Emerson, with Henry D. Thoreau, O. W. Holmes, and G. W. Curtis; other essayists of note were N. P. Willis, T. B. Aldrich, J. T. Fields, and J. G. Holland, while Charles Dudley Warner, Brander Matthews, and Agnes Repplier in a later generation did much to maintain the high standard.

UNITED STATES, TERRITORIAL EXPANSION OF THE, There have been thirteen additions to the original territory of the Union, including Alaska, the Hawaiian, Philippine, and Samoan islands and Guam, in the Pacific, and Porto Rico and Pine islands, in the West Indies, and the Panama canal zone; and the total area of the United States, including the noncontiguous territory, is now fully five times that of the original thirteen colonies. The additions to the territory of the United States subsequent to the peace treaty with Great Britain of 1783 are shown by the following table, prepared by the United States general land office:

ADDITIONS TO THE TERRITORY OF THE UNITED STATES FROM 1800 TO 1901.

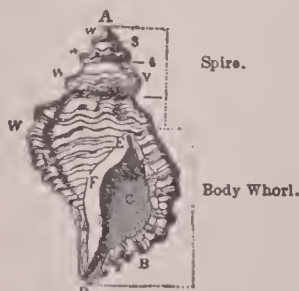
Territorial Division	Year	Area Added, S. Miles	Purchase Price, Dollars
Louisiana purchase..	1803	875,025	15,000,000
Florida	1819	70,107	5,499,768
Texas	1845	889,795	.....
Oregon territory	1846	288,689	.....
Mexican cession.....	1848	528,802	*18,250,000
Purchase from Texas	1850	†	10,000,000
Gadsden purchase....	1853	36,211	10,000,000
Alaska.....	1867	599,446	7,200,000
Hawaiian Islands....	1897	6,740	.....
Porto Rico.....	1898	3,600	.....
Pine Islands (W. I.)	1898	882	.....
Guam	1898	175	.....
Philippine Islands...	1899	143,000	20,000,000
Samoan Islands.....	1899	73	.....
Additional Phil'pines	1901	68	100,000
Total.....	....	2,937,613	87,039,768

*Of which \$3,250,000 was in payment of claims of American citizens against Mexico. †Area purchased from Texas amounting to 123,784 square miles is not included in the column of area added, because it became a part of the area of the United States with the admission of Texas.

Article 2 of the treaty between the United States and the Republic of Panama, ratified by the United States senate February 23, 1904, treaty in effect February 26, 1904, provided for the cession, in perpetuity, by Panama, of a strip of territory adjacent to the canal, as follows: "The Republic of Panama grants to the United States in perpetuity the use, occupation, and control of the zone of land and land un-

der water for the construction, maintenance, operation, sanitation, and protection of said canal of the width of ten miles, extending to the distance of five miles on each side of the center line of the route of the canal to be constructed; the said zone beginning in the Caribbean sea, three marine miles from mean low-water mark, and extending to and across the Isthmus of Panama into the Pacific ocean to a distance of three marine miles from mean low-water mark, with the proviso that the cities of Panama and Colon and the harbors adjacent to said cities, which are included within the boundaries of the zone above described, shall not be included within this grant. The Republic of Panama further grants to the United States in perpetuity the use, occupation, and control of any other lands and waters outside of the zone above described, which may be necessary and convenient for the construction, maintenance, operation, sanitation, and protection of the said canal or of any auxiliary canals or other work necessary and convenient for the construction, maintenance, operation, sanitation, and protection of the said enterprise. The Republic of Panama further grants to the United States in perpetuity the use, occupation and control of all islands within the limits of the zone above described, and in addition thereto the group of small islands in the Bay of Panama named Perico, Nacs, Culebra, and Flamingo."

UNIVALVE, a mollusc, with a shell composed of a single piece. The univalves include most of the Gasteropoda, as land-snails, sea-snails, whelks, limpets, etc. The majority of univalve



Univalve shell.

A, Apex. B, Base. C, Aperture. D, Anterior canal. E, Posterior canal. F, Inner lip, pillar lip, columellar lip or labium. G, Outer lip or labium. H, Peristome or margin of aperture. I, Whorls or volutions. J, Sutures, or lines of separation. K, Varix—The last whorl of the shell, usually much larger than the rest, is called the "body whorl," the rest of the volutions constitute the "spire."

shells are cone-shaped and spiral. In the simplest form the conical shape is retained without any alteration, as in the limpet. In most cases, however, the cone is elongated, sometimes forming a simple tube, as in Dentalium, but usually coiled up into a spiral.

UNIVERSALISTS, those who hold the doctrine that all men will be saved, in opposition to the doctrine of eternal punishment. A sect of this name was founded about 1750. They believe in the ultimate salvation of all men and created spirits, and direct their criticism against an eternal hell, and in some cases even against any suffering after death. The name Universalists is sometimes applied to the Arminians in consequence

of the universality which they ascribe to the operation of divine grace and their opposition to the doctrine of particular election.

UNIVERSITY. See articles following that of the different states.

UNIVERSITY, a corporate body or corporation established for the purposes of instruction in all or some of the most important branches of literature and science, and having the power of conferring certain honorary dignities, as arts, medicine, law, and theology. In most cases the corporations constituting universities include a body of teachers or professors for giving instruction to students; but this is not absolutely essential to a university, and London university, for instance, was long merely an examining body. In the middle ages, when the term began to be used in reference to seminaries of learning, it denoted either the whole body of teachers and learners, or the whole body of learners, with corporate rights and under by-laws of their own, divided either according to the faculty to which they were attached, or according to the country to which they belonged (hence the "nations" into which the students were classed, and which still exist in some universities). At a later period the expression universitas literarum (the whole of literature or learning) was used to indicate that all the most important branches of knowledge were to be taught in these establishments. Some, forming their notion of a university from the universities of Oxford and Cambridge, suppose that it necessarily means a collection and union of colleges, that it is a great corporation embodying in one certain smaller and subordinate collegiate bodies; but this is not correct, for many universities exist in which there are no colleges. This is the case with most of the German universities, and in the Scottish universities there are no foundations which bear any resemblance to the English colleges. Oxford and Cambridge differ from most universities also in the fact that, though they possess a body of professors, little of the teaching falls to be done by these. The oldest of the European universities were those of Bologna and Paris, and these formed the models on which most of the other early universities were established, a papal bull being generally regarded as necessary to this. The United States possesses the largest number of institutions bearing the name of universities, but a large proportion are sectarian, and many represent only a single faculty. For the chief universities see under separate heads, and refer to the articles following the different states.

UNIVERSITY EXTENSION, a movement to extend the means of higher education to persons of all classes and of both sexes engaged in the regular occupations of life. Any community may avail itself of the privileges by forming a local committee, who provide the necessary funds and fix fees, etc. The mode of instruction consists of courses of lectures by specialist graduates of the universities, each lecture being preceded or followed by a class, in which the students are orally examined by the lecturer, who also cor-

rects written papers done at home. An examination is held at the end of each course and certificates awarded. Home reading circles under the direction of leaders are one outcome of the movement.

UNIVERSITY OF NASHVILLE, THE, began its life in 1785, eleven years before Tennessee became one of the states of the Union, and only five years after the first settlement was made upon the site of Nashville, under a charter from the legislature of North Carolina to Davidson academy. In 1806 the legislature of Tennessee changed the name of the institution to Cumberland college, which it kept until 1825; it then became the University of Nashville. In 1874 the university offered most of its buildings and grounds for the establishment of Peabody Normal college, which has since become Peabody college for teachers, and which has about 12,000 alumni, men and women, a majority of whom have followed the teaching profession. The university has in addition an endowed primary department called the Montgomery Bell academy, with 3000 alumni. The university in all of its departments has on an average of 1300 or 1400 students.

UNIVERSITY OF THE SOUTH, THE, Sewanee, Tennessee; an institution of higher learning, including with its academic department the following professional schools: civil engineering, theology, law, medicine, pharmacy, a training school for nurses and a grammar school. Confers the following degrees in course: B.A., M.A., C.E., LL.B., B.D., G.D., M.D., Ph.G. The government of the university is vested in a board of trustees, consisting of eighteen bishops of the Episcopal church, one of whom is elected chancellor, a like number of clerical and twice that number of lay trustees, representing the following ecclesiastical divisions: Ashville; Alabama; North, East, and South Carolina; Georgia; Florida; Mississippi; Louisiana; Dallas, Texas and West Texas; Arkansas; Southern Florida; Kentucky; Lexington; Missouri, and Tennessee. The administration is vested in a vice-chancellor and a hebdomadal board. The university was organized and received its charter from the state of Tennessee in 1857. The civil war retarded its progress and it was finally opened in 1868. The graduate alumni number about 1000. The faculties number about fifty and the annual student attendance is between five and six hundred.

UNLEAVENED BREAD, was that form of bread used (Lev. ii. and iv.) in the Jewish temple service, and which, by the Mosaic law, the people were required to eat during the seven days of the Passover (Ex. xii. 15). It was the simplest form of bread, and was made without fermentation.

UPAS, a tree common in the forests of Java, and of some of the neighboring islands, and found also in tropical Africa. Many exaggerated stories were formerly current concerning the deadly properties of this plant, its exhalations being said to be fatal to both animal and vegetable life at several miles distance from the tree itself. The truth is, that

the upas is a tree which yields a poisonous secretion and nothing more.



Upas tree.

UP'UPA. See Hoopoe.

URÆ'MIA, a diseased condition of the body arising from the presence of urea in the blood, in consequence of the urine not being properly secreted, as in Bright's disease or other ailments, thus leaving in the blood elements that should be carried off.

URAL, a river of Russia, which rises in the Ural mountains, forms part of the boundary between Europe and Asia, and enters the Caspian after a course of about 1000 miles.

URAL MOUNTAINS, a series of mountains and plateaus stretching nearly north and south between Europe and Asia, from the shores of the Arctic ocean for a distance of about 1900 miles; highest summit, 5513 feet. The Ural mountains are celebrated for the mines of gold, platinum, copper, coal, and iron which they contain, and in the south are many broad valleys of remarkable fertility.

URANIA, in Greek mythology, the muse of astronomy. She is generally



Urania, antique statue in the Vatican.

represented holding in her left hand a celestial globe to which she points with a little staff.

URANIUM, a rare metal, whose chemical symbol is U, atomic weight 240, specific gravity 18.4. The chief source of uranium is pitchblende. Metallic uranium is obtained in the form of a black powder, or sometimes aggregated in small plates, having a silvery luster and a certain degree of malleability. It forms several oxides, which are used in painting on porcelain, yielding a fine orange color in the enamelling fire, and a black color in that in which the porcelain itself is baked.

U'RANUS, in Greek mythology, the son of Gæa, the earth, and by her the father of the Titans, Cyclopes, etc. He hated his children, and confined them in Tartarus, but on the instigation of Gæa, Kronos, the youngest of the Titans, overthrew and dethroned him.

U'RANUS, in astronomy, one of the primary planets, and the seventh from the sun, discovered by Sir William Herschel in 1781. It was first called Georgium Sidus in honor of George III., and afterward Herschel, in honor of the discoverer. To the naked eye it appears like a star of the sixth magnitude. Its mean distance from the sun is about 1754 millions of miles, and the length of the year 30,686.82 days, or about 84 of our years. Its mean diameter is estimated at about 33,000 miles. Its volume exceeds the earth's about 74 times, but as its mean density is only 0.17 (the earth's being 1) its mass is only about 12½ times more. The length of its day is supposed to be between 9 and 10 hours. It is now generally admitted that this planet has four satellites, which differ from the other planets, primary and secondary (with the exception of Neptune's satellite), in the direction of their motion, this being from east to west, and they move in planes nearly perpendicular to the ecliptic.

URE'TER, the excretory duct or tube which conveys the urine from each kidney to the bladder. In man it is about the size of a goose-quill; and its length is from 16 to 18 inches.

URETH'RA, in anatomy, the canal leading from the bladder to the external urinary opening, and serving for the excretion of the urine. In the male it is a complicated structure varying in length from 8 to 9 inches, and in the female it is a narrow membranous canal about 1½ inch in length.

URIC ACID, an acid which occurs in small quantity in the healthy urine of man and quadrupeds, and in much larger quantity in the urine of birds. Uric acid constitutes the principal proportion of the urinary calculi and the concretions causing the complaint known as the gravel.

URINE, an animal fluid or liquor secreted by the kidneys, whence it is conveyed into the bladder by the ureters and through the urethra discharged. In its natural state it is acid, transparent, of a pale amber or straw color, a brackish taste, a peculiar odor, and of a specific gravity varying from 1.012 to 1.030. The character of the urine, however, is apt to be altered by the state of health, the season of the year, age, food, and a variety of other causes. A knowledge of the urine in health, and of the variations to which it is subject in disease, is of the utmost importance to the medical practitioner. One of its morbid constituents is diabetetic sugar. See Diabetes.

URSA MAJOR AND URSA MINOR. See Bear, Great and Little.

UR'SULA, St., a virgin martyr, according to the legend a daughter of a prince in Britain put to death at Cologne by a horde of Huns, some say in 384, others in 453, together with 11,000 virgins who accompanied her. According to another reading the number of her companions was only eleven.

UR'SULINES, or **NUNS OF ST. URSULA**, a sisterhood founded by St. Angela Merici at Brescia, in 1537. They devote themselves to the succor of poverty and sickness and the education of female children. They had many houses in France during the 17th century. The Canadian Ursulines date from 1639; the Irish from 1771. There are now four houses in Ireland and four in England. In the United States there are twenty-four establishments with thousands of pupils.

URSUS. See Bear.

U'RUBU, the native name of an American vulture (black vulture or zopilote), very nearly allied to the turkey-buzzard, which it closely resembles. This voracious bird is common in the villages and towns of the southern states acting as a scavenger.

URUGUAY (u-rū-gwī), a river of South America, which rises in Brazil, in the province of Santa Catarina, flows first westward, then gradually turns south, and finally enters the estuary of La Plata opposite Buénos Ayres; length, about 800 miles.

URUGUAY, or **BANDA ORIENTAL DEL URUGUAY**, a republic of South America, bounded on the north and northeast by Brazil, on the east by the Atlantic, on the south by the Rio de la Plata, and on the west by the Uruguay, separating it from the Argentine republic; area estimated at 72,150 sq. miles. The surface forms a vast undulating plain, generally flat, but broken in the interior by several ridges of moderate elevation. The principal river is the Negro, which divides the state into two nearly equal portions, and on the southeast frontier is the large lake of Merim. The climate is mild and healthy, the general range of the thermometer being from 32° to 90° F. The extensive plains are admirably adapted for agriculture, which has made rapid progress in recent years, wheat, corn, etc., being cultivated; but the rearing of sheep and cattle is still the principal industry. The chief exports are hides, tallow, preserved meat, sheepskins, bones, wool and cereals, while the chief imports are cotton goods, woollens, coal, and iron. Montevideo is the capital and chief port. There is a small army and navy. Railways have a length of about 1000 miles. Primary education is by law compulsory; there are normal, secondary, and higher institutions, and a university at Montevideo. The Roman Catholic is the state religion, but all faiths are tolerated. The country is divided into nineteen provinces, and by the constitution of 1830 it is governed by a president, a senate, and a house of representatives. Uruguay at one time formed part of the Spanish viceroyalty of Buenos Ayres, and the language of the country is Spanish. Pop. 1,000,000.

USUFRUCT, in law, the temporary use and enjoyment of lands or tenements or the right of receiving the fruits and profits of lands or other things without having the right to alienate or change the property.

USURY. See Interest.

UTAH (ū'tā), one of the western United States, bounded by Idaho, Wyoming, Colorado, Arizona, and

Nevada. It ranks eighth in size among the states having an area, 84,970 sq. miles. The Wahsatch mountains divide Utah into two unequal portions; a hilly country on the east, drained by the Colorado, with its head streams the Green and Grand rivers, and numerous tributaries, and a high and generally sterile table-land on the west, the drainage of which falls into the different lakes. Of these the largest are the Great Salt Lake and Utah Lake, both in the northwest. Some peaks of the Wahsatch mountains are 10,000 to 13,000 feet above sea-level, while the average elevation of the valleys is 5000 feet. The climate is of the continental type, with sudden changes and great extremes in summer and winter, although the valleys being well sheltered, have generally a mild and pleasant climate. The rainfall throughout the state is insufficient for the needs of agriculture, and irrigation is everywhere necessary. The average precipitation for the state is 12 inches. The soil of the valleys, contains the elements of fertility, which render it very productive when irrigated. To the southwest of the Great Salt Lake lies the wide, arid plain known as the Great Salt Lake, or Great American, desert. Valuable deposits of gold, silver, copper, lead, iron,



coal, and other minerals exist, and the production of the mines is increasing. Agriculture is the chief occupation. It is dependent almost wholly upon irrigation, and Utah was the first state to demonstrate the possibilities of the irrigation system. The western half of the state belongs to the Great Basin, and nearly 90 per cent of the irrigated land is within this basin. Almost the entire water supply is drawn from streams. Wells afford a very small amount. Hay is the crop most extensively grown and also the most valuable crop, alfalfa being the principal variety. Wheat and oats are the most widely grown cereals. Much attention is given to vegetables, particularly potatoes and sugar-beets. Sufficient pasturage to support a considerable grazing industry is found in the eastern half and the valleys of the central region. A steady increase in the number of dairy cows and other cattle, horses and sheep has been maintained since 1850. The Union Pacific was the first railway to enter Utah, and since its advent in 1869 the development of the state has been very rapid. The total railway mileage in 1876 was 500; in 1894,

1847; and in 1907, 1835. The most important railway lines are the Rio Grande Western and the Oregon Short Line, extending north and south through the central part of the state, and the Union Pacific, passing through the northern portion. There are no navigable streams. Utah is the center of Mormonism. About three-fourths of its population is allied with the Mormon church. In recent years many other denominations have entered the state, of which the Catholics and Methodists are numerically the strongest. The leading educational institutions are the University of Utah, at Salt Lake City; Brigham Young College, at Logan; and the Agricultural College of Utah, also at Logan. A state normal college is maintained in connection with the State University, and there is a branch normal school at Cedar City. The first white explorers of Utah were Spaniards, sent by Coronado, who reached the Colorado river in 1540. The real history of Utah begins when the Mormons determined in 1846 to move west. The United States did not obtain possession of the territory until 1848, and did not immediately provide for its government. At first the Mormon church was the ruler, but with the coming of non-Mormons in 1849 the state of Deseret was organized, a constitution adopted, and a delegate sent to the United States congress asking admission. Congress refused to admit the state, but organized the Territory of Utah (September 9, 1850), and Brigham Young was appointed governor. The Edmunds bill in 1882 disfranchised all polygamists, and abolished most of the offices in the territory. Control was given to a commission of five men. A more stringent act was passed in 1887, the corporation of the Mormon church, and the Perpetual Emigration Fund were abolished, and their property escheated. In 1890, President Woodruff of the Mormon church issued a manifesto declaring that the church no longer countenanced polygamy. This was followed in 1891 by the formation of political parties, on national lines, and in 1893 amnesty was declared to all offenders who could show that they had not broken the law since 1890. Congress passed an enabling act for statehood in 1894, a constitution was formed on March 6, 1895, was adopted in November, and the state was admitted January 4, 1896. The constitution forbids polygamy and allows woman's suffrage. The state has voted in but three presidential elections. The silver question was the sole issue in 1896, and the vote was cast for the democratic silver candidate. In 1900 Republican electors were chosen, and by an increased majority in 1904 and 1908.

The capital is Salt Lake City; other cities are Ogden, Provo, and Logan. Pop. 1909, 350,000.

UTAH, University of, a state institution of learning for both sexes at Salt Lake City, Utah, founded in 1850 as the university of the state of Deseret. A new charter was secured in 1894, when the present corporate title was assumed. The departments are the school of arts and sciences; the state school of mines, established by the state legislature in

1901; the state normal school; and a preparatory department. Students are admitted on examination or on certificate from accredited schools.

UTAH LAKE, a fresh-water lake in Utah territory, 30 miles s. of Salt Lake City. It is 25 miles in length n. to s., with an extreme width of 13 miles. Its waters are drained into Great Salt Lake by means of the river Jordan. Several Mormon towns are on its eastern shores.

UTAHS, or **UTES**, a tribe of American Indians of the Shoshone family, living in New Mexico, Utah, Colorado, and Nevada. They practice hunting and fishing, but rarely engage in agriculture. They have now sold most of their lands to the United States government, retaining a large reservation in the southwest corner of Colorado.

UTERUS, or **WOMB**, an organ of females, situated between the bladder and rectum, in which the embryo is contained until it arrives at maturity, when it is finally born or expelled. In the virgin female it is somewhat pear-shaped, and measures about 3 inches long, 2 inches broad, 1 inch thick, and weighs about 1½ oz. It is divided into a fundus or base, a body, and a cervix or neck. It opens into the vagina by a transverse aperture. The organ is retained in its place by certain ligaments derived from the peritoneum. Its internal cavity is small, and at each superior angle at the fundus a Fallopian tube or oviduct enters. These tubes convey the ova or eggs from the ovary to the uterus. In structure the uterus is composed of an outer serous coat, a middle muscular coat, and an inner mucous lining. The arteries of the uterus are derived from the internal iliac and the aorta; the veins are large, and are called sinuses in the impregnated state. The nerves spring from the inferior hypogastric and spermatic plexuses, and from the third and fourth sacral nerves. The womb is liable to many diseases, of which the most frequent and important are inflammatory affections and tumors. It is also liable to become displaced in various ways, from laxity of its ligaments and other causes.

UTICA, an ancient city of North Africa, on the river Bagrada, near its entrance into the Mediterranean. After the destruction of Carthage, Utica became the capital of the Roman province. It was destroyed by the Arabs in the latter part of the 7th century.

UTICA, a city in New York, situated on the right bank of the Mohawk, 94 miles west by north of Albany. It has cotton factories, boot and shoe factories, flour, grist, and saw mills, tanneries, foundries, machine-shops, etc.; and an extensive trade, greatly facilitated by the Erie and the Chenango canals, and by several railways. Pop. 1909, 72,000.

UTILITARIANISM, the general name given to those schools of morals which define virtue as consisting in utility. The name is more specially applied to the school founded by Jeremy Bentham, in which the most recent exponent is John Stuart Mill, but there are many other developments of the same principle both in ancient and modern schools of moral See Ethics.

UTOPIA, a name invented by S

Thomas More, from the Greek *ou topos* (no place), and applied by him to an imaginary island, which he represents as discovered by a companion of Amerigo Vespucci. As described in his work called *Utopia*, written in Latin and published in 1516, the Utopians had attained great perfection in laws, politics, etc.

UTRECHT, (5'treht), an important town of Holland, capital of a province of the same name, 23 miles southeast of Amsterdam. Utrecht is the central point of the Dutch railway system, and carries on an extensive trade in grain and cattle, and in the manufactures of the place, which include Utrecht velvet, carpets, floor-cloth, cottons, linens, chemicals, etc. Utrecht is the oldest town in Holland. Pop. 104,194.—The province of Utrecht has an area of 532 sq. miles, with a pop. of 215,958. It is

generally flat, is well watered by the Rhine, Vecht, Amstel, etc., and is better suited for dairy-farming and stock-rearing than for corn-growing.

UTRECHT, Peace of, a series of separate treaties agreed upon at Utrecht by the powers which had been engaged in the war of the Spanish succession. On April 11, 1713, the States-general, Prussia, Portugal, and Savoy, signed separate treaties with France. The emperor refused to accede to the peace, and his differences with France were subsequently adjusted by the treaties of Rastadt and Baden in 1714. By the treaty with England, France, among other things, recognized the Hanoverian succession, engaged never to unite the crowns of France and Spain, and ceded to Britain Nova Scotia, Newfoundland, St. Kitt's, and Hudson's bay and straits. Gibraltar and Minorca were also ceded

V

V, the twenty-second letter of the English alphabet, a labial, formed by the junction of the upper teeth with the lower lip, and a gentle expiration. It resembles the letter *f*, but is sonant and not like it surd or hard.

VAAL RIVER, a river of South Africa, rises in the Quathlamba mountains, separates the Transvaal and Orange River colony and enters the Orange river; length 500 miles.

VACCINATION, inoculation with the cowpox—a disease akin to, but much less severe than smallpox—in order to prevent a person from catching the latter, or at least to make the attack much less severe. The practice of vaccination was introduced by Jenner, and it soon came into common use instead of inoculation. (See Jenner and Inoculation.) The usual method in vaccination is to make a few scratches across one another, with a clean lancet point, upon the upper part of the arm. The matter from the cowpox, or from the vaccination pustule produced on another person, is then rubbed on the skin where the scratches have been made. If the vaccination proves successful a small inflamed pustule appears about the third day, and increases in size until the tenth day. On the eighth day the constitutional effects manifest themselves by slight pain in the part, headache, shivering, loss of appetite, etc. These subside spontaneously in one or two days. Afterward the fluid in the pustules dries up, and a scab forms which disappears about the twentieth day, leaving a slight scar in the skin. Repeated vaccination with intervals of several years have been recommended by medical authorities. In the United States the vaccination of all children, excepting those in an unhealthy or otherwise unfit condition, is compulsory. In England since 1898 any parent who satisfies two justices or a stipendiary magistrate that he really believes that vaccination would be injurious to his child may be exempted from penalties.

VACUUM, empty space, or space devoid of all matter or body. Whether

there is such a thing as an absolute vacuum in nature is a question which has been much controverted. The existence of a vacuum was maintained by the Pythagoreans, Epicureans, and Atomists; but it was denied by the Peripatetics, who asserted that "nature abhors a vacuum." The modern theory, which seems to be warranted by experience, is that an absolute vacuum cannot exist, the subtle medium known as ether being believed to be everywhere present. In a less strict sense a vacuum (more or less perfect) is said to be produced when air is more or less completely removed from an inclosed space, such as the receiver of an air-pump, a portion of a barometric tube, etc. In the receiver of the air-pump the vacuum can only be partial, as the exhaustion is limited by the remaining air not having sufficient elasticity to raise the valves. The Torricellian vacuum, that is, the space above the mercury in a carefully manipulated barometer tube, is more nearly perfect in this respect, but even this space is to some extent filled with the vapor of mercury. If, however, an air-pump receiver, filled with pure carbonic acid gas (so as to expel the air), be exhausted, a small vessel containing moist caustic potash, and another containing concentrated sulphuric acid, having been previously introduced, the remaining carbonic acid is taken up and a vacuum produced so nearly absolute that the electric spark fails to pass through it.

VACUUM-BRAKE. See Brake.

VALAIS (vá-lā), a southern canton of Switzerland, abutting on France and Italy; area, 2026 sq. miles. It is surrounded on all sides by sections of the Alps, with ridges 13,000 to 15,000 feet high, and magnificent glaciers. Rich pastures support numerous cattle, the chief source of subsistence of the inhabitants; and in the lower valley of the Rhone there is much arable land, the finer fruits are grown, and silk-worms reared. Pop. 114,980.

VALENCIA, a city of Spain, capital of the province of the same name, on the Guadalquivir, 2 miles from the Mediter-

on behalf of Spain. Holland retained the Spanish Netherlands until a barrier treaty was arranged with Austria. Louis XIV. recognized the title of the King of Prussia, who received a part of Spanish Guelderland, and the sovereignty of Neuchâtel in Switzerland, while renouncing the principality of Orange. Savoy and Nice were restored to the Duke of Savoy, who was recognized as presumptive heir to the Spanish monarchy, and received the title of king. Philip V. was not recognized till the conclusion of these treaties, but France treated for Spain, and formal treaties corresponding with those with France were afterward signed with that power.

UZ, in the Old Testament, a region probably lying to the east or southeast of Palestine, known as the scene of the story of Job.

anean. The chief manufactures are silk, linen, hemp, glass, cigars, paper, and soap. Valencia was founded by Junius Brutus, 140 B.C. Pop. 204,768. The old province of Valencia is now broken up into the three provinces of Valencia, Alicante, and Castellon de la Plana. It is one of the most fertile and pleasant regions of Spain.

VALENS, Flavius, Roman emperor of the East, born in Pannonia in 328, and declared emperor of the East by his brother Valentinian I., who had already been elected emperor. The chief event of his reign was the war with the Goths under Athanaric, which lasted during the whole of Valens' reign. Irritated by the treatment they received at the hands of the imperial officials, they soon took up arms, and in 378 defeated Valens and destroyed the greater part of his army. Valens was never seen or heard of afterward.

VALENTIA, or **VALENCIA**, a small fertile island off the southwest coast of Ireland, belonging to county Kerry, about 5 miles long by 2 miles broad. It has slate and flag quarries, and productive fisheries. The British Atlantic telegraph cables to Newfoundland start from Valentia, and there is here a lighthouse.

VALENTINE, St., a saint of the Roman calendar, said to have been martyred in 306 A.D. The custom of choosing valentines on his day (14th February) has been accidentally associated with his name. On the eve of St. Valentine's day young people of both sexes used to meet, and each of them drew one by lot from a number of names of the opposite sex, which were put into a common receptacle. Each gentleman thus got a lady for his valentine, and became the valentine of a lady. The gentlemen remained bound to the service of their valentines for a year. A similar custom prevailed in the Roman Luperalia, to which the modern custom has, with probability, been traced. The day is now celebrated by sending sentimental or ludicrous missives specially prepared for the purpose.

VALERIAN, a plant, a native of

VALERIANUS

Europe, which grows abundantly by the sides of rivers, and in ditches and moist woods. The root has a very strong smell, which is dependent on a volatile oil. It is used in medicine, in the form of



Valerian.

infusion, decoction, or tincture, as a nervous stimulant and antispasmodic. Cats and rats are very fond of valerian. Red valerian, is occasionally found wild in Britain, and is cultivated in gardens, as well as many other species, on account of its elegant flowers. The valerian order consists of monopetalous exogens, annual or perennial herbs, rarely shrubs, inhabiting temperate climates.

VALERIA'NUS, Publius Licinius, Roman emperor from 253 to 260. He was taken prisoner by the Persians in 260, and his after fate is unknown.

VALETTA, a strongly fortified seaport, capital of Malta, on the n.e. coast of the island, situated on an elevated neck of land, with a large and commodious harbor on each side. The cathedral, built in 1580, contains the

here spent much of their time in drinking and feasting. The name is applied figuratively to any edifice which is the final resting-place of many of the heroes or great men of a nation, and specifically to an edifice built by Ludwig I. of Bavaria, a few miles from Ratisbon. See Walhalla.

VALKYR'IAS, in Northern mythology the "choosers of the slain," or fatal sisters of Odin, represented as awful and beautiful maidens, who, mounted on swift horses and holding drawn swords in their hands, presided over the field of battle, selecting those destined to death and conducting them to Valhalla, where they ministered at their feasts, serving them with mead and ale in skulls.

VALLADOLID (vál-yá-do-lid'), a city of Spain, capital of the province of the same name, 98 miles northwest of Madrid. It has a cathedral, many churches and suppressed convents, three hospitals, and a university. The manufactures consist of silks, cotton and woolen goods, hats, jewelry, paper, etc. Pop. 68,746.—The province has an area of 3042 sq. miles, and a population of 276,366. It is well watered by the Douro and its tributaries, and is very fertile.

VALLANDIGHAM (vál-lán'dí-gam), Clement Laird, American politician, was born at New Lisbon, Ohio, in 1820. He was elected to the Ohio legislature in 1845; edited the Dayton Western Empire in 1847-49; and from 1857 until 1863 was a member of the national house of representatives. He violently attacked the Lincoln administration both in and out of congress. After his

VAMPIRE

convention of 1864. In 1871 while acting as counsel in a murder trial he attempted to illustrate how the shooting occurred and was killed by the accidental discharge of the pistol.

VALPARAISO (vál-pá-rí'sō), the principal port of Chile, capital of the province of Valparaiso, situated on a large bay of the Pacific, 90 miles w.n.w. of Santiago. The bay is open to the north but well sheltered from winds in other directions, and is capable of accommodating a very large number of vessels. The custom-house is the only public building worthy of note. Valparaiso is the great commercial emporium of Chile,



and is in railway communication with Santiago, the capital. The chief imports into Valparaiso are manufactured goods, sugar, wine, tobacco, and cigars. The exports consist mainly of wheat, barley, wool, etc., and of mining produce. The imports of Valparaiso constitute nearly the whole of the imports of Chile, while the exports form a large portion of the total exports. An earthquake and fire in 1906 caused great loss of life and property. Pop. 143,022.—The province has an area of 1637 sq. miles, and a pop. 220,756.

VALVE, a kind of movable lid or cover adapted to the orifice of some tube or passage, and so formed as to open communication in one direction and to close it in the other, used to regulate the admission or escape of a fluid, such as water, gas, or steam. Some valves are self-acting, that is, they are so contrived as to open in the required direction by the pressure of the fluid upon their surface, and immediately to shut and prevent the return of the fluid when the direction of its pressure changes. Others are actuated by independent external agency. Examples of the former kind are presented in the valves of pumps, and in the safety-valves of steam boilers, and of the latter in the slide-valves appended to the cylinder of a steam-engine for the purpose of regulating the admission and escape of the steam. The construction of valves admits of an almost endless variety. See Safety-valve, Pump, etc.

VAMPIRE, a superstition of Eastern origin existing among the Slavonic and other races on the Lower Danube. A vampire is a ghost still possessing a human body, which leaves the grave during the night and sucks the blood of living persons, particularly of the young and healthy. Dead wizards, heretics, and such like outcasts become vampires, as does also any one killed by a vampire. On the discovery of a vampire's grave the corpse must be disinterred, thrust through with a white-thorn stake, and burned.



Bird's-eye view of Valetta.

tombs of the knights of Malta or of St. John, and in a chapel are the keys of Jerusalem, Acre, and Rhodes. Other notable buildings are the governor's residence, formerly the palace of the grand-masters; the library, museum, university, and the military hospital. The dockyard is capable of admitting the largest men-of-war. The mail steamers for Alexandria, Constantinople, etc., call here, and it is the chief station of the British fleet in the Mediterranean. Pop. 90,000. See Malta

VALHALLA, in Northern mythology, the palace of immortality, inhabited by the souls of heroes slain in battle, who

term in congress expired, he continued to make incendiary speeches against the government. As a result he was arrested in May, 1863, by order of General Ambrose E. Burnside; was tried by court martial; and was sentenced to be imprisoned in Fort Warren. President Lincoln, however, changed the sentence to deportation into the confederate lines. Thence Vallandigham made his way to the Bermudas, and thence to Canada. In the same year he was nominated by his party for the governorship of Ohio, but was defeated by the overwhelming majority of 100,000 votes. He took an active part in the democratic

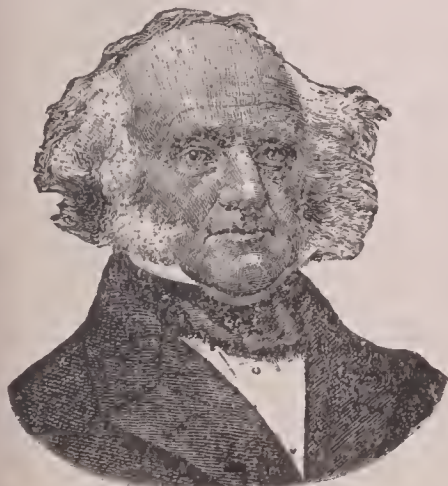
VAMPIRE-BAT, a name for certain bats inhabiting South America. The name was given from the blood-sucking habits attributed to these bats, but how many of them really attack animals and suck blood from them is not quite clear. One species at least, known as the vampire-bat, of large size and having formidable teeth, seems to be conclusively acquitted of the charge, its regular food being fruits and insects. It has large leathery ears, an erect spear-like appendage on the tip of the nose, wings when extended measuring 28 inches.



False vampire, one of the *vampyri*.

Several bats, however, have been proved to be blood-suckers, the best-known being a species only about 4 inches long and 15 or 16 in expanse of wing. It has large prominent upper incisors of peculiar shape, and upper canines somewhat similar, and the stomach and intestines are evidently specially adapted for a diet of blood. This species of bat seems to be generally distributed throughout the warmer parts of South America from Chile to Guiana. The blood-sucking propensities of these bats are by no means so dangerous as formerly and popularly described; but there is little doubt that they do attack horses and cattle, and sometimes even man in his sleep.

VAN BUREN, Martin, eighth president of the United States, born at Kinderhook, New York, 1782; died 1862. He early studied law, and in 1812 was elected to the state senate. He was attorney-general from 1815 to 1819, and in 1821 was elected United States



Martin Van Buren.

senator. In 1828 he became governor of New York, and in the following year President Jackson appointed him secretary of state. In November, 1832, he was elected vice-president, and in 1836 became president of the United States. The difficulties which his administration had to face were chiefly

connected with the deposit of state funds in private banks, and his method of dealing with these brought about his defeat at the next election in 1840. He was again nominated by the democrats in the elections of 1844 and 1848 but was unsuccessful on both occasions. He wrote a treatise entitled *An Inquiry into the Origin and Course of Political Parties in the United States* (1867).

VANCOUVER, George, English navigator, born about 1758, died 1798. He accompanied Cook on his second and third voyages (1772-74 and 1776-79); was made first lieutenant in 1780; and served in the *West Indies* until 1789. In 1790 he was put in command of a small squadron sent to take over Nootka from the Spaniards, and was also charged to ascertain if there was a north-west passage. He sailed in the *Discovery*, April 1, 1791, spent some time at the Cape, and afterward made for Australia and New Zealand, the coast of which he surveyed. He then went north and received formal surrender of Nootka, and spent the three summers of 1792-94 in surveying the coast as far north as Cook's Inlet, wintering at the Sandwich islands. On his return voyage he visited the chief Spanish settlements on the west coast of South America, and reached England in 1795, where a narrative of his voyage was published in 1798. Vancouver island was named after him.

VANCOUVER ISLAND, an island in the Pacific, off the west coast of British Columbia, of which province of Canada it forms part; length, from 250 to 300 miles; breadth, from 10 to 70 miles; area, about 15,000 sq. miles. It is generally mountainous, and heavily timbered. The climate is temperate, and the soil, in the south and east, fertile and favorable to agriculture and fruit-growing. Large quantities of salmon are exported, and there is an extensive



trade in fur, the skins exported being chiefly those of the minx, marten, sable, fox, bear, beaver, otter, seal, and deer. There are numerous good harbors along the coasts, the chief of which is Esquimault. As this island lies opposite the terminus of the Canadian Pacific railway it has recently acquired great importance. The chief town of the island, and the capital of British Columbia, is Victoria in the extreme southeast. Pop. of the island about 50,000.

VANDALS, a German nation or confederation, probably allied to the Goths, who occupied at an early period the country on the south of the Baltic, be-

tween the Oder and the Vistula. At a later period they appear to have descended into Silesia, and subsequently occupied Pannonia, Moravia, and Dacia. In 406, in conjunction with a German host, they ravaged Gaul, and thence found their way into Spain. After defeating an allied army of Goths and Romans, they seized Seville and Carthage, and, led by Genseric, crossed to Africa. Here they vanquished the Roman governor (429), and founded a kingdom, which absorbed the greater part of the Roman possessions. Genseric immediately began to revive the maritime glories of Carthage, and extended his conquests to Sicily, Sardinia, and Corsica. He also invaded Italy and sacked Rome in 455. Genseric concluded a long reign in peace in 477. The kingdom of the Vandals was continued under his descendants—Hunneric, his son, who immediately succeeded him; Gundamund, 484; Thrasimund, 496; Hilderic, 523; Gelimer, 530. It was overthrown in 534 by Belisarius, the general of the eastern Emperor Justinian.

VANDERBILT, Cornelius, American capitalist, born 1794, died 1877, amassed immense wealth in connection with shipping and railroads, a share of which he left to his eldest son William Henry, born 1821, died 1885, who was supposed at his death to be the wealthiest man in the world. The Vanderbilt university (Methodist Episcopal) at Nashville, Tennessee, was founded by Cornelius Vanderbilt, who presented it with \$1,000,000.

VANDERBILT, Cornelius, American financier and capitalist, was born at New Dorp, Staten Island, in 1843. In 1865 he entered the service of the New York and Harlem railroad, of which he was treasurer from 1867 to 1877. In 1877 he became first vice-president of the New York Central railroad. In 1878 he became treasurer of the Michigan Central railroad and vice-president and treasurer of the Canadian Southern. Subsequently he was president of both roads, besides being president of the New York and Harlem, and after 1886 chairman of the board of directors of the New York Central railroad. He died in 1899.

VANDERBILT, William Henry, American capitalist and financier, was born in New Brunswick, N. J., in 1821. He became vice-president of the New York and Harlem railroad in 1864; vice-president of the New York Central and Hudson river in 1865. He succeeded his father in 1877 as president of the latter road, and under his management the control was completed of the Michigan Central, Lake Shore and Michigan Southern, Canada Southern, and Chicago and Northwestern systems. Subsequently the "Nickel Plate" and West Shore roads were acquired. He died in 1885.

VAN DIEMEN'S LAND. See Tasmania.

VANDYCK (van-dik'), Sir Anthony, except perhaps Titian the greatest of all portrait-painters, was born at Antwerp on the 22d of March, 1599. Having acquired a great reputation as a portrait painter he was invited to England by Charles I., who bestowed upon him the

honor of knighthood. The painter by unceasing diligence, executed, besides a multitude of portraits, several myth-



Sir Anthony Vandyck.

ological and historical paintings. He died in 1641, and was buried at St. Paul's.

VANDYKE BROWN, a pigment obtained from a kind of peat or bog-earth, of a fine, deep, semi-transparent brown color; so called from its being supposed to be the brown used by Vandyck in his pictures.

VAN EYCK. See Eyck.

VANILLA, a flavoring agent used in confectionery, and in the preparation of liquors, procured from the fruit of orchidaceous plants of tropical America, remarkable on account of their climbing



Vanilla.

habit, and now cultivated in various tropical countries, including Ceylon and India. It has a fragrant odor, and is also used in medicine as a stimulant and promoter of digestion.

VAN RENSSLAER (văn rên'se-lër), Stephen, American political leader known as the "Patroon," was born in New York in 1764. He was lieutenant-governor of New York from 1795 to 1801; presided over the state constitutional convention of 1801; and was again in the assembly in 1808-10. He took an active interest in the construction of the Erie canal and was one of its strongest promoters. In 1824 he established at Troy a scientific school which, two years later, was incorporated as the Rensselaer Polytechnic institute. From 1823 to 1829 he was a member of congress. He died in 1839.

VAPOR, in physics, a term applied to designate the gaseous form which a solid or liquid substance assumes when heated. Vapor is, therefore, essentially

a gas, and seeing that all known gases have now been proved to be liquefiable, no physical difference can be said really to exist between an ordinary gas, such as oxygen, and a vapor, such as steam. In common language, however, a difference is usually recognized; a gas is a substance which at ordinary temperatures and pressures exists in a state of vapor, while a vapor is produced by the application of heat to a substance which normally exists in a solid or liquid form. The difference has been otherwise explained to be one not so much of kind as of degree; steam in the boiler of a steam-engine being said to be in a state of vapor, while superheated steam is said to be a gas. Aqueous vapor formed on the surface of the land and water is always present in suspension in the atmosphere, and when it meets with a reduction of temperature it condenses into water in the form of rain or dew.

VAR, a department in the southeast of France, bordering upon the Mediterranean, and covered in the interior with ramifications of the Alps; area, 2349 sq. miles. Pop. 325,490.

VARICOSE VEINS, veins in a diseased state, which become dilated and uneven, and form hard knotty swellings in the situation of their valves. The disease is a common affection of the lower limbs, where sometimes the varix bursts and hæmorrhage takes place. It also occurs in the veins of the scrotum and lower rectum, producing in the latter case bleeding piles. Varicose veins are caused by local obstruction of the circulation of the blood, and are common in pregnancy, while stout people, and those who stand most of the day at work, are apt to suffer from them. The treatment consists in the application of proper bandages, and rest to the limb supported in an elevated position.

VAR'UNA, in Hindu mythology, the god of water, the cause of rain, lord of rivers and the sea, the Hindu Neptune or Poseidon indeed. His name corre-



Varuna, the Indian God of Waters.

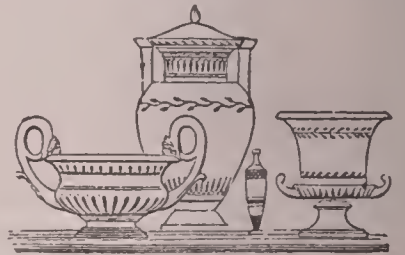
sponds with Greek Ourānus (Urānus), and meant originally the sky or heavens. He is represented as a white man, four-armed, riding on a sea animal, generally with a noose in one of his hands and a club in the other.

VASA, Gustavus. See Gustavus I.

VASCULAR TISSUE, in plants, consists of elongated ducts or cells, which may have closed extremities, so that fluids pass from one cell to another through the partition walls, or these partitions may be partly obliterated, thus forming a continuous tube. See Botany.

VASE, a name applied to certain ves-

sels of an ornamental character. Vases were made in ancient times of all materials, but those which have come down to us in greatest numbers are the so-called Etruscan vases, made of terra cotta, and adorned with painted figures. Such vases have been found in most Greek cities as well as in Etruria, and all are really the productions of Greek art. The Greek vases of the oldest style mostly come from Corinth and the islands of Thera and Melos; and those of the late rich style have been almost exclusively discovered in Lower Italy (Apulia and Lucania), and were probably manufactured there, chiefly in the 4th and 3d centuries B.C. Vases were used for all purposes, but one peculiar and very common application of them



Grecian vases.



Chinese, Japanese and Indian Vases.

was to adorn sepulchers. Chased metal vases were in use in ancient times both among the Greeks and Romans, and many of the more valuable and beautiful kinds of stone were also used for making vases. Murrine vases were highly esteemed at Rome. Another favorite kind of vases at Rome was that called cameo vases, made of two layers of glass, the outer of which was opaque, and was cut down so as to leave figures standing out upon the lower layer as a ground. The celebrated Portland vase is an example of this kind. At a later period glass vases surrounded with delicate filagree work were introduced. Italy, France, and Germany in the 16th and 17th centuries produced many vases which are the perfection of artistic form and execution, and since the 15th century many master-pieces of the glass art in the form of vases have issued from the Venetian manufactories. From India, China, and Japan also have been obtained vases of various materials, especially of porcelain, vying in elegance of form and beauty of ornamentation with those produced in Europe.

VASSAL. See Feudal System.

VASSAR COLLEGE, a university at Poughkeepsie, New York, founded by Matthew Vassar in 1861 for the higher education of women. It is a fine brick edifice, 500 feet long by 200 wide, and was erected at a cost of about \$200,000 being opened in September, 1865. It confers the degrees of B. A. and M. A.,

and the course of studies resembles those of other first-class colleges.

VATICAN, the most extensive palace of modern Rome, the residence of the pope, built upon the Vatican Hill, from which it has received its name, on the opposite side of the river from the bulk of the city, immediately to the north of the cathedral of St. Peter's. It is a long rectangular edifice lying north and south, with an irregular cluster of buildings at either end. The present building was begun by Pope Eugenius III. (1145-53), and has been enlarged and embellished by many subsequent popes down to the last one (Leo XIII.). It now possesses twenty courts, and, it is said, 11,000 rooms of one sort or another. Immense treasures are stored up in it. Here are celebrated collections of pictures of many of the great masters, and museums in which all periods of the arts are represented by many of their most perfect productions. Among its noblest art treasures are the frescoes on the ceiling of the Sistine chapel, painted by Michael Angelo, and consisting of scenes and figures connected with sacred history; and the frescoes painted by Raphael on the ceilings and walls of certain apartments known as Raphael's stanze, the subjects being biblical, allegorical, etc. Since the return of the popes from Avignon, the Vatican has been their principal residence, and here the conclaves always meet for the election of new popes. The Vatican library was first constituted by Pope Nicholas V. (1447-55), and was added to and enlarged by Leo X., Pius IV., Pius V., and other popes. The most important part of the library is the manuscript collection, which is said to contain about 25,600 MSS. The number of printed volumes has been estimated at from 150,000 to 220,000, including 2500 15th-century editions, and a great number of bibliographical rarities.

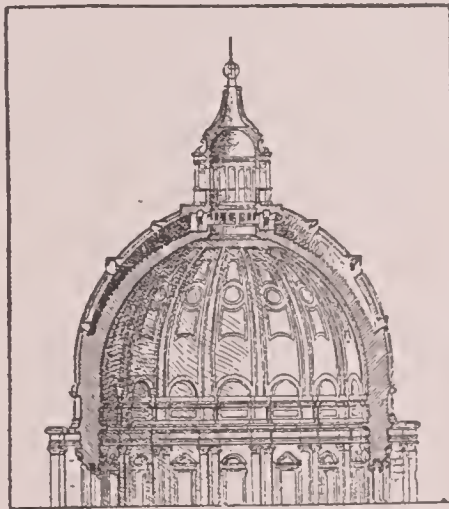
VATICAN COUNCIL, the Ecumenical Council of the Church of Rome, which met in the Vatican in 1870, and declared the personal infallibility of the pope when speaking ex cathedra to be a dogma of the church.

VAUCLUSE (vō-klūz), a department in the southeast of France; area, 1370 sq. miles. It is rugged and mountainous in the east, but more than one-half of the whole surface is arable, and vineyards occupy about one-sixth of this portion. The mulberry (for the rearing of silk-worms) and olive are extensively cultivated. Avignon is the capital. Pop. 235,457.

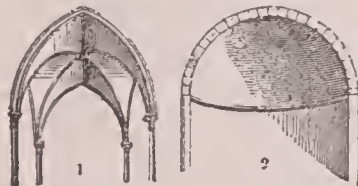
VAUD, or **PAYS-DE-VAUD**, a western canton of Switzerland; area, 1244 sq. miles. It has three mountain systems—the Alps in the southeast, the Jura in the west, and the Jorat in the south; and partly embraces the lakes of Geneva and Neuchâtel, belonging both to the basins of the Rhine and the Rhone. The capital is Lausanne. Pop. 279,152.

VAULT, in architecture, a continued arch, or an arched roof, so constructed that the stones, bricks, or other material of which it is composed, sustain and keep each other in their places. Vaults are of various kinds, cylindrical, elliptical, single, double, cross, diagonal, Gothic, etc.

VEDAS, the oldest of the Shastras or sacred writings of the Brahmans, and the oldest compositions in the Sanskrit language. Their date is unknown. Sir W. Jones fixes it at 1500 B.C., and Ritter at 1400 to 1600 B.C. They are four in number, called respectively the Rig, Yajur, Sāma, and Atharva Veda. All the Vedas are believed to be inspired, and are held by the Brahmans in the highest respect. The religious system of the Vedas is at bottom monotheistic. It derives a polytheistic appearance from the mention of the deity by various names according to the difference of his manifestations and attributes (Sūrya, Mitra, etc., the sun; Soma, the moon; Agni, fire; Indra, the firmament, etc.); but the unity of the supreme being is expressly asserted in more than one passage. Each of the Vedas is divided into three parts: the first called the Sanhitā, a collection of hymns and prayers called mantras or gānas; the second, Brāhmana, which relates chiefly to ritual; and the third, the Jnāna or Upanishads, which is the philosophical portion of the work. The Upanishads are sometimes called collectively the Vedānta. The Rig-veda is the oldest of the Vedas, and the Atharva-veda the latest. Some scholars question whether the latter should be regarded as a Veda. Varying greatly in age, the Vedas represent many stages of thought and worship, the earliest being the simplest, the later following and reflecting the development of the Brahmanical system, with all its superstitions and rites.



Double vault.—Section of dome of St. Peter's, Rome.



1, Gothic groined vault.
2, Spherical or domical vault.

VEGETABLE CHEMISTRY, the department of organic chemistry which investigates the chemical compounds found in vegetables. These compounds are chiefly made up of carbon, hydrogen, oxygen, and nitrogen, but potash, soda, lime, and other substances are occasionally present in small and variable

quantities. Sugar, starch, gum, and other distinct compounds existing already formed in plants, and capable of separation without suffering decomposition, are called proximate or immediate principles of vegetables. Proximate analysis is the separation of a particular principle from others with which it is mixed. Ultimate analysis consists in the reduction of the proximate principles to their simplest parts. The more important classes of compounds to be obtained from vegetables are acids, alkalis or alkaloids, oils, and resins. Coloring matter, tannin, albumen, gluten, yeast, and other substances are also obtained. Of the acids the chief are acetic acid or vinegar, oxalic, tartaric, and benzoic acids. The alkaloids are organic bases which produce remarkable toxicological effects. During the germination of seeds there is a conversion of starchy matter in the sugar. The nutrition of plants may be regarded as depending upon solar energy organic and mineral constituents, and water. See Botany.

VEGETABLE IVORY, the name which is applied to the kernels of the nuts produced by a palm growing in South America. It is very hard and compact, has the appearance of ivory, and may be turned in the lathe, being used for buttons, umbrella handles, etc. The stem of the palm is extremely short, but the leaves rise to the height of 30 or 40 feet.

VEGETARIANISM, the theory and practice of living solely on vegetables. The doctrines and practice of vegetarianism are as old as the time of Pythagoras, and have for ages been strictly observed by many of the Hindus and of late years the practice of subsisting solely upon vegetable food—or at least of rejecting flesh food—has been brought prominently before the public.

VEIN, in mining, a crack or fissure in a rock, filled up by substances different from the rock, and which may either be metallic or non-metallic. Veins are sometimes many yards wide, having a length of many miles, and they ramify into innumerable smaller parts, often as slender as threads. Metallic veins are chiefly found in the primary, and lower and middle secondary rocks.

VEINS, a system of membranous canals or tubes distributed throughout the bodies of animals for the purpose of returning the impure blood to the heart and lungs, after it has been conveyed to the various parts by the arteries. They are not elastic and have no pulsation (thus differing from the arteries), the motion of the blood in them being mainly secured by pressure of the moving parts between which they are embedded, the backward flow of the blood being prevented where necessary by a series of valves which permit a current only toward the heart. The veins at their farthest extremities form capillaries which collect from the tissues the blood brought by the arterial capillaries. These minute branches unite to form veins, which similarly unite in turn, forming gradually larger branches and trunks as they approach the heart. The venous blood from the head, neck, and upper limbs is all returned to the heart by one great vein, the vena cava superior, while that from the lower limbs

and belly is returned by the vena cava inferior. The portal vein (vena portæ) receives the venous blood from the intestines and conveys it through the liver to the vena cava inferior. From each lung to the heart come two pulmonary veins carrying back the blood that has been purified in the lungs, after being carried to them by the pulmonary artery. See Heart.

VELASQUEZ (ve-lás'keth), or in full Don Diego Rodriguez de Silva y Velasquez (or Velazquez), an eminent Spanish historical and portrait painter, was born at Seville in 1599. He was appointed principal painter to Philip IV. in 1623. In 1629 he went to Italy, where he closely studied the works of Michael Angelo, Raphael, and Titian. On his return to Spain in 1631 he was received with great distinction, and in 1658 the king raised him to the dignity of a noble. He died in 1660. Among his best works are the Aguador, or Water-carrier; the Orlando Muerto; a Nativity, or Adoration of the Shepherds; the Brothers of Joseph; Moses taken from the Nile; portraits of Philip IV. and of Elizabeth his queen, Pope Innocent X., and other dignitaries; and many pictures from history and from common life.

VELLUM. See Parchment.

VELOCITY, the rate at which a body changes its position in space. Velocity is popularly expressed as so many miles per hour, or as so many feet per second. The velocity of a body is uniform when it passes through equal spaces in equal times, variable when the spaces passed through in equal times are unequal, accelerated when it passes through a greater space in equal successive portions of time, as is the case of falling bodies under the action of gravity, and retarded when a less space is passed through in each successive portion of time. Angular velocity is such a velocity as that of the spoke of a wheel, being measured as a number of angles of a specified extent (as right angles) divided by a measure of time in specified units. See Fall of Bodies, Dynamics, Projectiles, Motion, etc.

VELOCITY OF WIND. See Beaufort Scale.

VELVET, a rich silk stuff, covered on the outside with a close, short, fine, soft shag or nap. In this fabric the warp is passed over wires so as to make a row of loops which project from the backing, and are thus left, by withdrawing the wire, for an uncut or pile velvet, but are cut with a sharp tool to make a cut velvet. Florence and Genoa have been long noted for the manufacture of velvet, but Lyons, in France, is now its principal seat. Cotton and woolen fabrics woven in this manner are called velveteen and plush respectively.

VENDEE (vân-dā), a western maritime department of France; area, 2595 sq. miles. The surface is much diversified, and is watered in the north by tributaries of the Loire, and in the south by the Lay and tributaries of the Charente. The principal crops are grain, flax, and hemp; and a white wine is also produced. Capital, La Roche-sur-Yon. Pop. 439,637.

VENDEMAIRE (vân-dā-mi-ār; that is, "vintage month"), the first month in

the French revolutionary calendar, from 22d September to 21st October. See Calendar.

VENDET'TA, a blood-feud; the practice of the nearest of kin executing vengeance on the murder of a relative. In Corsica the vendetta is regarded as a duty incumbent on the relatives of the murdered man, and, failing to reach the real murderer, they take vengeance on his relatives. The practice exists, although to a more limited extent, in Sicily, Sardinia, and Calabria, as well as among the Druses, Circassians, Arabs, etc.

VENDOME, Louis, Duke of, the celebrated general of Louis XIV., was born in 1654. After having distinguished himself in Italy, Tyrol, and Belgium, the Duke of Burgundy was placed over him; and the disagreement of the two commanders caused the defeat of the French at Oudenarde (July 11, 1708). Vendôme was recalled. Soon after being placed in command in Spain he gained several distinguished successes, but died in 1712.

VENEER, a thin layer of choice hard wood, such as mahogany, rosewood, maple, etc., glued to the surface of wood of a commoner sort, such as fir or pine, so as to give the whole the appearance of being made of the more valuable material. It is mostly used for furniture, and owing to recent improvements in sawing machinery, layers as thin as paper can be obtained.

VENESECTON. See Phlebotomy.

VENETIAN ARCHITECTURE, Venetian Gothic, that style of Italian architecture employed by the Venetian architects from the 15th to the early part of the 17th century. The principal characteristics are: each story is provided with its own tier of columns or pilasters, with their entablature, and separated from the other stories by con-



Venetian architecture.
An angle of the Ducal Palace.

spicuous friezes or belts, often in the form of balustrades broken by pedestals and ornamented by figures; arched windows ornamented with columns, the spandrels being filled with figures; ornamental parapets are common; and the whole has a rich and varied effect. This style of architecture is characterized by Fergusson as "Gothic treated with an Eastern feeling, and enriched with many details borrowed from Eastern styles."

VENETIAN SCHOOL, in painting, that school which counts among its masters Titian, Paul Veronese, Giorgione, Tintoretto, and many other illustrious names.

VENEZUELA (ven-es-wā'là), a northern republic of South America, bounded by the Caribbean sea, the Atlantic, British Guiana, Brazil, and the United States of Colombia; area, 566,159 sq. miles. The Andes enter Venezuela from the west in two branches; the western branch has a moderate elevation, rarely exceeding 4000 feet, but the eastern branch, which is about 300 miles long by 60 miles broad, has an average altitude of 12,000 feet, culminating in Sierra Nevada-de-Merida with summits attaining 15,000 feet. There are other branches running northeast and parallel to the north coast, and in the south, on the frontiers of Guiana, are the mountains of Parima. From these mountains to the coast chain at Carácas, and from the Andes to the mouth of the Orinoco, extend vast plains (or llanos) with an area of 300,000 sq. miles. The chief rivers are the Orinoco and its affluents; the principal lakes are Maracaybo and Tacarigua. The climate is equatorial in character, and the seasons are distinguished into the wet and the dry. It is not unhealthy on the whole. The greater part of Venezuela is liable to earthquakes. The valleys and tablelands of the coast mountains are the chief seats of cultivation. The region of palms extends from the sea-level to the height of 3300 feet; mingled with the palms are cacti, mimosæ, the pine-apple, the milk-tree, mahogany, and trees yielding caoutchouc, sarsaparilla, copaiba, and other drugs. Above 2000 feet are the forests of cinchona or Peruvian-bark tree, the vanilla, plantain, etc. All the grains of temperate regions attain perfection at an elevation of 8000 feet. Cultivated plants include the cacao, cocoa-nut, tobacco, corn, (two crops yearly), cotton, coffee, sugar, and indigo. Among the minerals are gold, silver, tin, and copper; good coal is found in the coast districts; asphalt and petroleum abound round Lake Maracaybo. The gold mines are now being worked by English and other capital. The wild animals include the jaguar (now rare), puma, tapir, ounce, monkeys, serpents, alligators, the manatee, etc. The population is of Spanish, Indian, and Negro origin, either of pure or mixed blood. More than half of the population are mestizoes, mulattoes, and other mixed breeds. The chief exports are coffee, cocoa, hides, and skins. cattle, dye-woods, gold, and copper ores. The imports are chiefly manufactured goods, machinery, etc. Venezuela is divided into states and territories, each state having its own legislature and executive, its own budget, etc. The legislature for the whole republic consists in a congress of two houses, at the head of the executive being a president. The republic was formed in 1831 by secession from Colombia. It has suffered greatly from intestine dissensions, and has also had boundary disputes with its neighbors. The British Guiana frontier was determined by the award of a court of arbitration in 1899. The capital is

VENICE

Caracas. The chief ports are La Guayra, Puerto-Cabello, Maracaybo, and Ciudad Bolivar. Pop. 2,323,527.

VENICE, a city and seaport of Northern Italy, capital of the province of the same name, on a number of islets in a shallow lagoon in the northwest of the Adriatic, 23 miles east of Padua by rail. The islets are very low, and the houses are mostly supported on piles. A railway viaduct near $2\frac{1}{2}$ miles long connects the town with the mainland. The city is divided into two parts by the Canalazzo or Grand canal, spanned by an elegant bridge, the Rialto, and several lesser bridges. The numerous branch canals are crossed by about 380 bridges, which rise rapidly toward the center to afford passage to the gondola and other boats. The city is also intersected by calli or narrow lanes for pedestrians; but the canals are really the streets of Venice, and it possesses neither horses nor wheeled carriages. Near the center of the city there is one street about 18 feet wide, the Merceria, but the great center of business and amusement is the Piazza, or Square of St. Mark,



and the piazzetta adjoining it. The Piazza is about 570 feet long by 200 broad, contains some of the more remarkable public buildings, and is lined with handsome shops and cafés. The piazzetta faces the sea. The Palace of the Doges, reconstructed by Marino Falieri in 1354, abuts on the piazzetta. The Ponte-dei-Sospiri (Bridge of Sighs) connects the palace with the public prisons on the opposite side of a narrow canal. The church of St. Mark, now the cathedral (erected 976-1071), is surmounted by five domes. The principal front is adorned with 500 columns of precious marble. Above the doorway are the four celebrated bronze horses brought from Constantinople by the Doge Dandolo in 1204. The chief manufactures are woolen cloth, cloth of gold and silver, velvet, lace, ornamental, and colored glass, mosaic, jewelry, castings, etc. The trade is extensive; the imports include colonial goods, dye-woods, coal, iron, oil, etc.; exports timber, rice, linen, glass, coral, etc. Venice is supposed to have been founded in the 5th century by inhabitants of the surrounding districts, who took refuge from the cruelty of Attila on the islets at the mouth of the Brenta. In 1866 the city and province was ceded to Napoleon

III., under whose auspices they were united by a plebiscite to the Kingdom of Italy. Pop. 151,841.

VENICE, Gulf of. See Adriatic Sea.

VENOMOUS ANIMALS, animals capable of inflicting poisonous wounds by means of special organs or contrivances. They include spiders, bees, wasps, hornets, scorpions, certain serpents, etc. In all cases the venomous matter must be introduced directly into the circulation to produce its effects.

VENTILATION. See Warming and Ventilation.

VENTRICLE. See Heart.

VENTRIL'OQUISM, the art of speaking in such a way as to cause a hearer to believe that the sound comes, not from the person speaking, but from a different source. The name originated from the erroneous supposition that the sounds uttered were formed in the belly, whereas practice alone is necessary to carry this act of illusion to a high degree of perfection. The sounds are formed by the ordinary vocal organs—the larynx, the palate, the tongue, the lips, etc. The art of the ventriloquist consists merely in this: After drawing a long breath he breathes it out slowly and gradually, dexterously modifying and diminishing the sound of the voice; besides this he moves his lips as little as possible, and by various contrivances diverts the attention of his auditors. This art was known to the ancient Greeks.

VE'NUS, the Roman name of the goddess of love, called by the Greeks Aphroditē. In the Iliad she is described as the daughter of Zeus and Dīōnē; but Hesiod represents her as the offspring of Urānus, born among the foam of the sea. She surpassed all other goddesses in beauty, and hence received the apple



Venus, antique statue in the British Museum.

which was to be awarded to the most beautiful by Paris. She was the wife of Hephæstos (Vulcan), but also bestowed her love on the gods Arēs (Mars), Dionysos (Bacchus), Hermes (Mercury), and Poseidon (Neptune), and the mortals Anchises and Adonis. The myrtle, rose, poppy, apple, and other fruits were sacred to her, as were also the dove, sparrow, swan, swallow, ram, hare, and tortoise. The chief places of her worship in Greece were the islands of Cyprus and Cythera. In Rome several temples were erected to her under different

VERB

names. In the best days of art this goddess was always represented draped, in later times nude. The scene of her arising from the sea was sculptured by Phidias on the base of the statue of Zeus at Olympia, and one of the most famous pictures of Apelles represented the same subject. The Venus of Capua and the Venus of Milo represent her as Venus Victrix, with one foot on a helmet and raising a shield. The Venus de' Medici is supposed to be a free copy of a statue of her by Praxiteles, which was celebrated above all her other statues in ancient times. Among modern statues of Venus, one of the most famous is that by Canova, which represents her as issuing from the bath.

VENUS, one of the inferior planets, having its orbit between Mercury and the earth, and the most brilliant of all the planetary bodies. From her alternate appearance in the morning and evening she was called by the ancients Lucifer and Hesperus, the morning and evening star. The mean distance of Venus from the sun is about 66,134,000 miles, her diameter 7510 miles, and her period of revolution round the sun about 224.7 mean solar days. Her volume is equal to about $\frac{1}{100}$ ths of the earth, but her density being slightly greater her mass is actually equal to about $\frac{1}{100}$ ths of the earth. The period of rotation round her axis is the same as that of revolution round the sun. The axis of rotation is inclined to the ecliptic at about 75°. According to her various positions relatively to the sun and earth she exhibits phases like the moon. Like Mercury, Venus transits the face of the sun, but at longer intervals. The transits of Venus are of much more importance than those of Mercury, because, being nearer to us when in transit, her position on the sun is measurably different for observers placed on different parts of the earth. See Transit.

VERA-CRUZ (vā'rā-krōs), the chief seaport of Mexico, situated in the state of the same name. The harbor, though improved, is still unsatisfactory, but there is a large trade. The town has broad and regular streets, and some good buildings, and is defended by the fortress of San-Juan-de-Ulloa on an island in front of the harbor. The situation of the town is exceedingly unhealthy. It was founded by Cortez in 1520. Pop. 24,000.—The state stretches along the s.w. part of the Gulf of Mexico; area, 26,225 sq. miles. The products embrace all kinds of grain crops, tobacco, sugar, cotton, fruits, dye-woods, and timber. Cattle, horses, and sheep are numerous. Pop. 960,570.

VERB, in grammar, that part of speech whose essential function is to predicate or assert something in regard to something else (the subject or thing spoken of); as, the boy runs, the man lifts the stone, fishes swim, he suffers much. Verbs usually have the power of indicating time and mode by means of tenses and moods, these varying in the different languages, as does also the conjugation or system of verbal inflections and forms as a whole. They have been divided into active and neuter verbs, according as they predicate action or state. Active verbs are divided into

intransitive and transitive, according as the action is confined to the actor or passes from him to an object. Intransitive verbs often take an objective of their own nature; as, he runs a race; he sleeps the sleep of death. When a verb may be used either transitively or intransitively, as, he walks the horse, he walks to church, the verb in the former use is said to be causative. Many causative verbs are distinguished from their corresponding intransitives, by a change of form, as sit, set; lie, lay; fall, fell. Passive verbs affirm suffering or endurance of what another does. Hence, only verbs which take an object after them can have a passive voice, because it can be said of objects only that they suffer or endure the action directed on or toward them by the subject of the active verb. Passive verbs are thus the correlatives or complements of active verbs.

VERBE'NA, a genus of plants, the type of the natural order Verbenaceæ. Most of the species are American; about seventy are enumerated. Several spe-



Verbenas—Garden varieties.

cies are cultivated for the great beauty of their flowers, being fine border plants. The verbena of the perfumers is the lemon-grass, from which the "oil of verbena" is extracted.

VERBENA'CEÆ, a natural order of plants, consisting of trees, shrubs, and herbaceous plants common in the tropics of both hemispheres. They have generally opposite or whorled simple or compound leaves without stipules; flowers in opposite corymbs, or spiked alternately, sometimes in dense heads, seldom axillary or solitary. The verbena and teak are examples.

VERDE, Cape. See Cape Verde.

VERDI, Giuseppe, an Italian operatic composer, born in 1813. His first production was *Oberto, Conte di San Bonifazio* (1839), and in 1842 he brought out with great success at the La Scala, Milan, his *Nabucco*, followed by *I Lombardi* (1843), *Ernani* (1844), *Rigoletto* (1851), *Il Trovatore* (1853), *La Traviata* (1853), *Un Ballo in Maschera* (1859), *Aida* (1871), *Otello* (1886), and *Falstaff* (1893). Verdi has a fine dramatic gift, and his melodies are showy and taking. He was an Italian senator. He died in 1901.

VERDICT. See Jury.

VERDIGRIS, a poisonous substance, prepared by exposing copper to the air in contact with acetic acid, and used as a pigment, as a mordant, in medicine, etc.

VERESHTCHAGIN, Wasiliy, a Russian historical painter, born in 1842, and educated at the naval school in St.

Petersburg. In 1864 he entered the Ecole des Beaux Arts at Paris, where Gerôme was his master. He joined the Caucasian expedition under General Kaufmann in 1867, and in 1869 went to Siberia. In 1874 he went to India with the Prince of Wales, and afterward settled in Paris. He took part in the Russo-Turkish war, and was wounded at Plevna. Since that time he has visited all the chief cities of Europe exhibiting his pictures. They are of immense size, extremely realistic, and treat chiefly of the horrors of war. He has lately taken up religious subjects, and his Family of Jesus and The Resurrection attracted some attention. He died in 1904.

VERGIL. See Virgil.

VERMICELLI, (-chel'lē). See Macaroni.

VERMIL'ION, the name given to a pigment of a beautifully scarlet color, obtained from crystallized mercuric sulphide. It is extensively employed in painting, in making red sealing-wax, and other purposes.

VERMONT, one of the United States, bounded by Canada, New York, Massachusetts, and by the Connecticut river; area, 9565 sq. miles. It ranks thirty-ninth in size among the states. The surface is traversed from south to north by the Green mountains, which culminate in Mansfield mountain in the n.w., 4280 feet high. The drainage is shared between Lake Champlain in the west, and the Connecticut and its affluents. The surface is generally fertile, grain growing in the valleys, while the higher lands furnish excellent pasture. The climate is healthy; and the temperature ranges from 20° below zero in winter up to 90° in summer. The soil is stony and of poor quality, though in the valleys, in the western lowlands, there is much land that is suitable for cultivation. There are large forests of pine and hemlock, with spruce and fir on the higher slopes. On the lower lands there are also forests of deciduous trees, the sugar maple being one of the most common trees. The principal mineral wealth of Vermont is in its rocks, which furnish a great variety of marble, from white to almost pure black. Granite, slate, and soap-stone are abundant. The quartz-mica-schists furnish excellent whetstones. Important veins of asbestos are bedded in the serpentine rocks in the north central part of the state. Among metallic ores iron and copper are abundant, lead, manganese, gold, and silver are also found in small quantities. Agriculture has always been the leading industry in the state. With the adoption of intensive methods of cultivation the soil is made to produce abundantly, the production of corn per acre being greater than that of any other state. Vermont produces more maple sugar than any other state in the Union, and two-fifths that of the entire country. Cattle-raising has become the predominant industry in Vermont agriculture. The horses of Vermont were among the first to win fame on the race-courses of the country, and include the Morgan, Messenger, and Black Hawk stocks. Sheep are also given considerable attention. The important industries are

those which depend upon the forests for their raw materials. The increase in dairying has been accompanied by a rapid development of the factory production of butter and condensed milk. The stone resources of the state has afforded a basis for the manufacture of monuments and tombstones. The more important of the other industries are the manufacture of flour and grist-mill products, foundry and machine-shop products, woolen goods and hosiery, and knit goods. Burlington is the largest manufacturing center. The Central of Vermont, the Boston and Maine, and the Grand Trunk are the chief railroads



The seal of Vermont.

of the state. There is a considerable internal and transit trade, but the foreign trade is limited, being chiefly carried on through New York and Massachusetts. The early inhabitants were largely of the English "Non-Conformist" or "Independent" type, who became known as Congregationalists, and they have continued the strongest religious sect in the state. Later the Methodists became important. Still later the influx of foreigners brought a strong Catholic element. Of higher institutions the state supports normal schools at Randolph, Johnson, and Castleton, and a state university, including agricultural and medical departments, at Burlington. The Congregationalists maintain a college at Middlebury. Vermont, first became known to Europeans in 1609, when Champlain explored the lake since known by his name. During the next century the lake and its borders were a thoroughfare for various military expeditions in the Indian and colonial wars, and several points along the lake were occupied, mainly as military posts, by both French and English; but the first permanent settlement was made in 1724 at Fort Dummer in the limits of Brattleboro. Vermont was admitted as the fourteenth state in March, 1791. In May, 1775, the "Green Mountain boys" under Ethan Allan and Seth Warner had captured Ticonderoga and Crown Point. The battle of Bennington in August, 1777, was won by the combined forces of Vermont and New Hampshire. During the whole struggle the state, though unrecognized, contributed its full share of men and means. In the war of 1812-14 Vermont is credited with 5236 soldiers in regular service, exclusive of 2500 volunteers who were under arms at Plattsburgh in September,

1814. In the civil war of 1861-65 the state furnished more than its due quota of troops, 33,288 men from a total population (1860) of 315,098. The Fenian operations against Canada, in 1866 and 1870, had their base in St. Albans. The state adopted a prohibitory amendment to the constitution in 1852, but abandoned the policy of prohibition in 1902, when the voters of the state declared for high license. This measure, amounting to local option regulation, became law in 1903. In 1792, 1796, and 1800, the state was carried for federalist electors, but was democratic-republican thereafter to 1824. In that year, and again in 1828, the Adams republicans were successful. In 1832 the vote was cast for the anti-Masonic candidate. After that time it was steadfastly whig to 1852, and has been republican, by large majorities, ever since. Montpelier is the capital, but Burlington is the largest town. Pop. 350,000.

VERNE (vern), Jules, a popular French romancer, born at Nantes in 1828. He studied law for some time, but afterward began writing short pieces for the stage. In 1863 he published *Five Weeks in a Balloon*, and the vein of the marvelous, tinged with a quasi-scientific truthfulness, has since been worked by him with great success. His more popular works are: *Twenty Thousand Leagues under the Sea*, *From the Earth to the Moon*, *Across Africa in a Balloon*, *A Journey to the Center of the Earth*, *Around the World in Eighty Days*, *Giant Raft*, etc. Most of his works have been translated into English and German. He died in 1905.

VERONA, a city of Northern Italy, capital of the province of same name, beautifully situated on both sides of the rapid Adige, a fortress of the first class, walled, and entered by five beautiful gates. Verona has a Roman amphitheater, supposed to have been built about the 2d or 3d century of our era, the interior of which is nearly perfect; an imposing cathedral in the Gothic style dating from the 14th century, and many other magnificent churches rich in paintings and other art treasures. Other notable edifices are the Palazzo del Consiglio, adorned with statues of celebrated natives of the town; and the Gothic tombs of the Della Scala family (Scaligeri), who ruled Verona from 1262 to 1389. Modern public buildings include theaters, a museum, a library, hospitals, literary institutions, etc. The town has manufactures of silk, woollens, hats, etc., and a considerable trade. Pop. 74,261.

VERONESE (vā-ro-nā'ze), Paul, the popular name of Paolo Cagliari, an eminent Italian artist, born at Verona, in 1528. He was a contemporary of Titian and Tintoretto. He died at Venice April 19, 1588. Among his masterpieces are: *The Calling of St. Andrew to the Apostleship*, *The Rape of Europa*, *The Family of Darius at the Feet of Alexander*, *Adoration of the Magi*, *Consecration of St. Nicholas and St. Helena*, *The Vision of the Invention of the Cross*; the last five mentioned are in the National gallery.

VERSAILLES (ver-sälz'), a town of France, capital of the department of Seine-et-Oise, in a plain, 11 miles s.w.

of Paris. It is regarded as one of the handsomest towns in Europe, having been built under the auspices of the sovereigns of France, particularly Louis XIV., who made it the seat of his court, and erected the palace. This is a large and imposing building with an extensive park and gardens, fine fountains, etc. Louis Philippe converted the palace into a national museum, and it contains an immense collection of statues and paintings representing personages and events connected with the French monarchy from Clovis downward. In October, 1870, the Germans established their headquarters at Versailles; and from March, 1871, till 1879, it was the seat of the French government. Pop. 54,081.

VERSE, a measured and cadenced form of speech or composition, usually adopted in poetry. It seems to be the natural language of passion, yet it has unquestionably been improved and developed by art. The use of rhymed cadences is a comparatively modern invention. (See Rhyme.) Grammarians have elaborately classified the varieties of verse, and analytically distinguished the possible divisions of words into bars of accented and unaccented syllables. (See Rhythm.) The term is also applied to a line of poetry consisting of a certain number of metrical feet disposed according to the rules of the species of poetry which the author intends to compose. Verses are of various kinds, as hexameter, pentameter, etc. Blank verse is verse in which the lines do not end in rhymes. (See Blank Verse.) Heroic verse is rhymed verse in which the lines consist of ten syllables, five of them being accented, and constituting five iambic feet.

VERST, a Russian measure of length, equal to 3500 English feet, or very nearly two-thirds of a mile.

VERTEBRA. See Spine.

VERTEBRA'TA, the name given to the highest sub-kingdom of animals, consisting of those animals which in early life usually possess a backbone, but which invariably possess a notochord which have never more than four limbs disposed in pairs; which possess jaws as parts of the head; and which have the great nerve-centers contained within a special case formed by the skull and spinal column. In all Vertebrata save the lancelet a distinct heart is developed. The Vertebrata include the classes Pisces (fishes), Amphibia (frogs, etc.), Reptilia (reptiles), Aves (birds), and Mammalia (quadrupeds and man). They have also been classified into Ichthyopsida, including Pisces and Amphibia; Sauropsida, comprising Reptilia and Aves; and Mammalia.

VERTI'GO (or ver'ti-go), an attack of giddiness or swimming of the head in which objects appear to move in various directions though stationary, and the person affected finds it difficult to maintain an erect posture. It is a common symptom of an irregular (excessive or defective) supply of blood to the brain and of nervous and general debility; but it frequently arises from some disturbance of the digestive organs.

VESA'LIUS, Andreas, the father of

modern anatomy, born at Brussels 1514, died at Zante 1564. He was physician to the Emperor Charles V. and to Philip II. His chief work, *De Corporis Humani Fabrica*, opened a new era in the science of medicine.

VESPA'SIAN, Titus Flavius, Emperor of Rome, was born near Reate, in the country of the Sabines, in A.D. 9. After serving with distinction in Germany and in Britain as commander of a legion, he was made consul. He afterward became proconsul of Africa, and on the rebellion of the Jews he was sent with an army into Judæa (A.D. 66). He reduced nearly all Galilee, and was preparing to attack Jerusalem, when he received news of Nero's death (A.D. 68). Then followed the emperors Galba, Otho, and Vitellius, and in A.D. 69 Vespasian was himself elected emperor by



Coin of Vespasian.

the army, and arrived in Rome about the middle of the year 70, leaving the siege of Jerusalem to his son Titus. He immediately reformed the discipline of the army, purified the senatorial and equestrian orders, and improved the administration of justice. He favored arts, letters, and learned men, particularly Quintilian, Pliny, and Josephus. He rebuilt a part of the city, restored the capital, and erected the gigantic amphitheatre, the ruins of which are still celebrated under the name of the Coliseum. Vespasian died in June, A.D. 79.

VESPER, the evening service in Roman Catholic and other churches, or the time of evening service, being the last of the canonical hours except compline.

VESPUCCI, Amerigo. See Amerigo Vespucci.

VESTA, a Roman divinity, the goddess of the hearth. She was worshiped along with the Penates, at every family meal, when the household assembled round the hearth, which was in the center of the room. Her public sanctuary was in the Forum, and the sacred fire was kept constantly burning in it by the vestals, her priestesses. The vestals are said to have been established by Numa. There were at first four, and afterward six of them. They were taken from six to ten years of age. They were bound to virginity for thirty years, the term of their service, after which they were allowed to marry. Their persons were inviolable, and they were treated with great honor, and had important public privileges. The punishment of a vestal who was guilty of unchastity was burying alive.

VESTA, in astronomy. See Asteroids.

VESTMENTS, Sacred, the official garments worn by ministers of religion.

The term is also applied to the altar-cloths. Among Catholics and High Churchmen, who believe that Christianity has retained a special priesthood and ritual, much importance is attached to vestments. See Ritualism; also Chasuble, Stole, etc.

VESTRY, a room adjoining a church where the vestments of the clergy are kept. Hence the place of meeting of those having the charge of parochial affairs, and collectively the persons themselves to whom these affairs are intrusted. In England the minister, churchwardens, and chief men of a parish generally constitute a vestry, and the minister, whether rector, vicar, or perpetual curate, is ex-officio chairman. The powers of the vestry include the expenditure of the church funds, the repairing or alteration of churches or chapels, and the appointment of certain parish officers. In certain large and populous parishes select vestries are annually chosen from the chief or most respectable parishioners to represent and transact the business of the parish. In London the vestries are highly important bodies. In the United States the vestry is a highly developed body with wide powers. The rector is *ex officio* a member of the vestry, and is entitled to preside, if present, at all its meetings. The function of the vestry is to represent the congregation in law, to have charge and care of its property and to collect and disburse its revenues.

VESUVIUS, a historic volcano, situated 10 miles east southeast of Naples, and chiefly noted for having buried with its ashes the ancient cities of Herculaneum and Pompeii. Previous to the eruption of 1906 it rose in the center of a plain 2300 feet above the sea, in a pyramidal cone of about 1900 feet; total height, over 4200 feet. Previous to an eruption about 1838 the top was an uneven plane, but was then converted into a hollow cup sloping to a depth of 500 feet. A precipitous rocky ridge, 1400 feet high, called Monte Somma, lies to the north of the cone, from which it is separated by a deep valley called the Atrio del Cavallo. At the western extremity of this valley an observatory



Map showing new crater of Vesuvius. The black shading is the pathway of the lava.

has been established. The lower belt of the sloping plain is about 2 miles broad; it is laid out in vineyards and well cultivated. Above this belt the plain is rugged and covered with scorix. Monte Somma is supposed to have formerly formed a complete cone of larger dimensions than the last one, being subsequently altered by volcanic forces in

the same manner as 800 feet of the present cone was carried away by an eruption in 1822. The volcano began in March, 1906, to give evidence of an unusual disturbance, and during the next few weeks there followed a continuous eruption which threatened Naples, with its 500,000 population, and caused the death of nearly 1000 persons. An entirely new crater was established, changing the whole topography of the mountain and making this most recent eruption one of the most important in the history of the volcano.

After several days of earthquake the lava burst from the new crater and ran down the slope to Boscotrecase, which it completely destroyed. The streams were several hundred feet wide and covered the ground to the depth of 10 to 40 feet, fresh rivers of melted rock pouring over the earlier ones as they hardened by cooling. The ashes so filled the air as to cause partial darkness, and the people had to protect themselves by goggles and cloths from blindness and suffocation. The ground was covered with a gray mantle of fine ashes, as far as Naples and the east coast. The weight of the cinders which fell upon the Monte Olivete market in Naples broke down the roof, crushing over 200 people. Vesuvius rises in the center of a plain 2300 feet above the sea. The old cone, previous to the recent eruption, was 1900 feet high, with a total height of 4200 feet, and 2000 feet in diameter. The first recorded symptoms of disturbance were those of A. D. 63. Desultory quakes followed until A. D. 79, when Herculaneum and Pompeii were buried. Another eruption took place in 1036. Since numerous outbreaks have been recorded, the most disastrous being that of 1631 when 18,000 lives were lost. Violent outbreaks also took place in 1759, 1767, 1794, 1822, 1855, 1858, 1861, 1865, 1867, 1872, 1878, 1879, and 1885.

VETERINARY ART, the art which deals with the nature, causes, and treatment of the disorders of domestic animals. The first veterinary school was instituted in 1762 at Lyons; in 1766 that at Alfort near Paris was opened. A similar institution was established at London in 1791, and in the year following one in Berlin. In Edinburgh instruction in veterinary medicine began to be given by Mr. Dick in 1819, and in veterinary surgery in 1823. In America veterinary chairs have been added to some of the universities, but most of the schools are private institutions.

VETO (Latin "I forbid"), the power which one branch of the legislature of a state has to negative the resolutions of another branch; or the right of the executive branch of government, such as king, president, or governor, to reject the bills, measures, or resolutions proposed by other branches. In Britain the power of the crown is confined to a veto, a right of rejecting and not resolving, and even this right is rarely exercised, the last occasion being in 1707. In the United States the president may veto all measures passed by congress, but after that right has been exercised the rejected bill may become law by being passed by two-thirds of each of the houses of congress.

VIADUCT, a structure of wood, iron,

stone and brickwork for conveying a roadway across a valley or low level. In recent years, the term viaduct has come to mean more specifically a metal structure composed of a number of comparatively short spans carried by tower-like piers of steel framework. These piers usually consist of four column-like legs spread wide apart at the bottom and converging toward the top, which are braced together in all directions. See Bridge.

VIAT'KA, a town of Russia, capital of the government of same name, on the Viatka, 500 miles e.n.e. of Moscow. It has a cathedral, some manufactures, and a large trade. Pop. 24,258.—The government has an area of 59,172 sq. miles, and a pop. of 3,028,788.

VIBORG (vë'börg), a government occupying the southeastern part of Finland, Russia. Area 13,525 square miles. The coast region along the Gulf of Finland and Lake Ladoga is low and exceedingly indented. The interior is rocky and mountainous and interspersed with marshes and lakes. The chief rivers are Kymenne and the Wuoxen. Viborg has extensive deposits of building stone, copper, lead, and iron. Rye, oats, and barley are grown. The forests occupy a large part of the area and are an important source of income. The manufacturing industries are highly developed. The commerce is mainly with Russia. Pop. 400,000, chiefly Finns. Viborg is the capital. Pop. 33,000.

VIBURNUM, a genus of plants, including the gelder-rose and laurustine, and the wayfaring tree, a native of Europe and the west of Asia. The young shoots are used in Germany for basket-making; the wood is sometimes employed in turning and cabinet-making; the berries are used for making ink, and the bark of the root for making bird-lime.

VICE-ADMIRAL. See Admiral.

VICE-CONSUL. See Consul.

VICENZA (vi-chen'tsá), a town of North Italy, capital of a province of the same name, 49 miles west of Venice. The most remarkable edifices are the Duomo or cathedral; the Palazzo della Ragione (town-hall), an ancient Gothic building, with fine connected buildings by Palladio; the museum, one of Palladio's finest buildings; the Palazzo-Prefettizio, and the theater, both by Palladio; the lyceum, churches, and hospitals. The manufactures are silk, woollen, and linen tissues, leather earthenware, hats, etc. Pop. 44,261.—The province has an area of 940 sq. miles and a pop. of 446,521.

VICE-PRESIDENT, the second officer of the government of the United States in rank and chosen for the same term and in the same manner as the president. He performs no executive functions whatever, his only duty being to preside over the deliberations of the senate except when it is sitting as a court of impeachment for the trial of the president, when the chief justice presides. He has a casting vote in the senate in case of a tie, and he presides at the joint meeting of the two houses when the electoral votes are counted. The chief importance of the office consists in the fact that the vice-president is made by the constitution the successor of the



VESUVIUS.
A new view of the crater at the height of eruption.

VICHY

president in case of the latter's removal from office or of his death, resignation, or inability to discharge the powers and duties of the office. The qualifications required of the vice-president are the same as those of the president. His salary is \$12,000 per year.

VICHY (vē-shē), a town of France, in the department of the Allier, in a valley of the river of that name, 32 miles s.e. of Moulins. The Vichy waters are in much request for disorders of the stomach and bowels, and of the urinary organs, in gout, rheumatism, etc. Much of the water is sent out in bottles. Pop. 8486.

VICKSBURG, a town in Warren co., Mississippi, on the Mississippi, 400 miles above New Orleans. It is a port of entry, and has an extensive trade in cotton. Vicksburg was strongly fortified by the confederates in the civil war, and the Unionist forces were repulsed here on several occasions, but after a long siege General Pemberton surrendered the place to General Grant, July 4, 1863. Pop. 15,373.

VICTOREMMANUEL (Vittorio Emanuele) II., the eldest son of Charles Albert, king of Sardinia, was born at Turin, March 14, 1820, and he married on April 12, 1842, Archduchess Adelaide of Austria. His aptitude for a military career became evident when he commanded the Savoy brigades against Austria (1848-49), and distinguished himself in the battle of Goito by his reckless valor. After the battle of Novara (March 23, 1849) his father abdicated, and Victor Emmanuel ascended the throne of Sardinia. He had then to negotiate with Austria under most unfavorable circumstances, but he steadily



Victor Emmanuel.

refused to give up the principle of representative government in the Sardinian constitution, and this gained for him the name of honest king and the goodwill of the Italian people. This latter was only gained, however, after much calumny and misunderstanding, but the young king pursued from the first a policy which led to the national unity of Italy. Under the advice of his celebrated minister Cavour, he regulated the finances, reorganized the army, and secularized the church property, for which he was excommunicated by the pope. He took part in the Crimean war, and in 1859, assisted by France, renewed the contest with Austria, taking part in the battles of Magenta (4th June) and Solferino (24th June). By

the Treaty of Villafranca and the Peace of Zürich which followed these successes, Lombardy was added to his dominions, but he had to cede Savoy and Nice to France. Parma, Modena, and Tuscany, now became united to Sardinia, and Garibaldi's successes in Sicily and Naples brought the whole of Southern Italy over to Victor Emmanuel. On March 17, 1861, he assumed the title of King of Italy, and early in 1865 Florence became the royal residence. By the Peace of Vienna (1866) Austria ceded Venetia, and on the withdrawal of the French garrison from Rome in 1870 the city annexed itself to Italy. The king entered Rome on July 2, 1871, and took up his residence in the Quirinal. He died 9th June, 1878, and was succeeded by his son Humbert.

VICTORIA, a British colony in the southeast of Australia, bounded n. by New South Wales, s.e. by the Pacific, s. by Bass strait and the Southern ocean, and w. by South Australia; area, 87,884 sq. miles. It has about 600 geographical miles of sea-coast, with considerable bays and indentations, especially about the middle, where Port Phillip Bay, with an area of 375 sq. miles and an entrance barely 2 miles wide, affords shelter sufficient for the largest fleet. Victoria is the principal gold-producing colony of Australia. Tin, antimony, copper, and coal are also among the minerals worked. Agriculture has greatly extended of late years, wheat and oats being the two cereals chiefly cultivated. The great staple of the colony, however, is wool. The government is invested in a governor appointed by the crown, aided by an executive ministry consisting of twelve members, and a parliament consisting of a legislative council of forty-eight members elected for fourteen provinces, and a legislative assembly of ninety-five members for eighty-four districts. The colony possesses a small permanent military force, besides militia and volunteers, and there is a small fleet of war-vessels. Since 1901 Victoria has formed a state of the Australian commonwealth. There were in 1907, 3425 miles of railway open (all belonging to the government), and upward of 16,000 miles of telegraph wire with 843 telegraph stations. Education is compulsory between the ages of six and thirteen. Besides the Melbourne university there are several colleges connected with various religious denominations. Pop. 1,201,506.

VICTORIA, capital of British Columbia, in Vancouver island, on the north side of the Strait of Juan de Fuca. There are government buildings, town hall, cathedral, etc., and some good streets. The harbor for large vessels is at Esquimault, 3 miles distant, where there is a station of the British navy. Pop. 20,816.

VICTORIA CROSS, a British military decoration, instituted at the close of the Crimean war in 1856. It is granted to soldiers and sailors of any rank for a single act of valor in presence of the enemy. It was instituted in imitation of the French cross of the Legion of Honor. It is a bronze Maltese cross, with a royal crown in the center, surmounted by a lion, and the words "For

Valour" indented on a scroll below the crown. The ribbon is red for the army,



Victoria cross.

and blue for the navy. A pension of \$50 a year accompanies the decoration, when gained by anyone under the rank of commissioned officer, with an additional clasp and \$25 if gained a second time.

VICTORIA I. (Alexandrina), Queen of Great Britain and Ireland and Empress of India, only child of Edward, duke of Kent, and of his wife Princess Victoria Mary Louisa, daughter of the Duke of Saxe-Coburg-Saalfeld, widow of the Prince of Leiningen, and sister of King Leopold of Belgium, was born at Kensington Palace, May 24, 1819. Her father died January 23, 1820, and she became heiress-presumptive to the crown on the accession of William IV. in 1830. The latter dying without issue (June 20, 1837), she ascended the throne of Great Britain and Ireland, that of Hanover falling by the Salic law to her uncle, the



Queen Victoria.

Duke of Cumberland. She was crowned in Westminster Abbey, June 28, 1838, and on February 10, 1840, married her cousin, Prince Albert of Saxe-Coburg-Gotha. Prince Albert died on 14th December, 1861, a blow which so affected the queen that she made but few appearances in public for years. In 1876 she assumed the title of Empress of India. The jubilee of her reign was celebrated in 1887 and the "diamond jubilee" in 1897. She wrote *Leaves from the Journal of Our Life in the Highlands* (1868), and *More Leaves* (1884). She died at Osborne House, Isle of Wight, on 22nd January, 1901, and was succeeded by her eldest son Edward

VII. Her remains were placed beside those of Prince Albert in the mausoleum at Frogmore.

VICTORIA NYANZA, a lake of East Africa, about 400 miles inland from the Indian ocean, crossed near its north end by the equator, about 3800 feet above the sea; area, 29,000 sq. miles. It communicates with the Albert Nyanza by means of the Victoria Nile, and is the principal feeder of the White Nile. It contains many islands, some of them of considerable size. It was discovered by Captain Speke in 1858. Its northern shores belong to British East Africa and its southern to German East Africa.

VIENNA, capital of the Austro-Hungarian empire, is situated in a plain on the right bank of the Danube, and is intersected by a narrow arm of the river into which fall the Wein and other small streams. The old town is still the court and fashionable quarter of the city, and is encircled by the Ringstrasse, a handsome boulevard, 55 yards wide. Vienna is on the whole a handsome, well-built town, with fine squares and straight and spacious streets. Of the churches the most remarkable is the Domkirche, or cathedral, of St. Stephen, a cruciform Gothic structure, with a main tower 453 feet high. The interior is adorned with numerous statues and monuments, and the tower contains a bell of 18 tons weight. The modern palaces of the archdukes and others of the nobility, are

between eastern and western Europe. Pop. 1,662,269.

VIENNA, Congress of. This congress was assembled on November 1, 1814, to reorganize the political system of Europe after the first overthrow of Napoleon. The principal powers represented in it were Austria, Russia, Prussia, England, and France. Spain, Portugal, Sweden, and other minor powers were also consulted on matters more nearly concerning them. The leading territorial adjustments effected by the congress were the following: Austria recovered Lombardy and Venetia, while Tuscany and Modena were conferred on collateral branches of the imperial house. The king of Sardinia recovered Piedmont and Savoy, with the addition of Genoa. Murat retained Naples, but the Bourbons were soon reinstated. Holland and Belgium were erected into a kingdom for the Prince of Orange, William I. Hanover, with the title of king, returned to the king of England, and Great Britain retained Malta, Heligoland, and several conquered colonies. A federative constitution, with a diet at Frankfort, was established for Germany. Prussia received the duchy of Posen, the Rhine province, and a part of Saxony. Russia received the greater part of the grand-duchy of Warsaw, Cracow becoming a free state protected by Russia, Austria, and Prussia. Sweden retained Norway, and Denmark was in-

woolen and other tissues, paper, and leather are the chief manufactures. Limoges is the capital. Pop. 363,182.

VIGIL, an ecclesiastical term applied at first to the evening, and afterward to the whole day, preceding a great festival. This name originated from the circumstance that the early Christians spent a part of the night preceding such festivals in prayers, to prepare themselves for the coming celebration.

VIK'ING (from the Icelandic vik, a bay or fiord, and the termination ing, implying one who belongs to or is descended from: literally one who lurked in bays and issued thence to plunder), a rover or sea-robber belonging to one of the bands of Northmen who scoured the European seas during the 8th, 9th, and 10th centuries. This word has been frequently confounded with sea-king, a term which is applied to a man of royal race, who took by right the title of king when he assumed the command of men, although only of a ship's crew; whereas the former term is applicable to any member of the rover bands. See Northmen.

VILLARD, Henry, American financier was born in Spire, Bavaria, in 1835. He came to the United States in 1853. He married a daughter of William Lloyd Garrison in 1866, and for two years afterward was European correspondent of the New York Tribune. In 1875 Mr. Villard became president of both the Oregon and California railroad, and the Oregon Steamship company. In 1879 he organized the Oregon railway and navigation company. He was elected president of the Northern Pacific railway in 1881, and from 1889 to 1893 was chairman of its board of directors. He died in 1900.

VILLARS (vil-är), Claude Louis Hector, Duc de, one of the greatest generals of the age of Louis XIV., was the son of the Marquis de Villars, and was born at Moulins in 1653. He early distinguished himself under Turenne, Condé, and Luxembourg, and was created *maréchal de camp* in 1690, and lieutenant-general in 1693. He defeated Prince Louis of Baden at Friedlingen, 14th October, 1702, for which he received the marshal's baton; and defeated the Prince of Baden at Höchststadt, 21st September, 1703. His success in dealing with the insurrection of the Camisards obtained for him the title of duke (1705). Having been sent to defend the frontier against Marlborough, he forced the formidable lines of Stollhofen, near Strasburg, and penetrated far into Germany (1705-1707). In 1709 he replaced Vendôme in Flanders, and fought the battle of Malplaquet against Marlborough and Eugene, in which he was seriously wounded. In 1712 he defeated the allies at Denain, took Marchiennes, and relieved Landrecy. After the Peace of Utrecht he opposed Eugene with uninterrupted success, and negotiated with him the Peace of Rastadt, 7th March, 1714. On the renewal of the war with Austria in 1733 he was sent to Italy at the head of an army, with the title of marshal-general of France. After a successful campaign, he died at Turin, 1734.

VILLEINS, a species of feudal serfs



Street in Vienna.

many of them, handsome buildings. Deserving of special mention are the houses of parliament, the magnificent Gothic town-house (1872-83), the courts of justice, the museums of art and of natural history, and the exchange. The university was founded in 1237, and reorganized by Maria Theresa. The imperial library contains 440,000 volumes and 20,000 MSS. The imperial museum of natural history is one of the finest in Europe. The treasury, among other imperial treasures, contains the regalia of Charlemagne. Vienna is the first manufacturing town in the empire, and its manufactures include cotton and silk goods, leather, porcelain, arms, hardware, and many other articles. There is also a large inland trade. It is now the center of a great railway system, and the center of the shipping trade

demnified with Lauenburg. The congress was suddenly broken up by Napoleon's escape from Elba (February, 1815); but its acts were signed by the powers interested on 9th June, 1815.

VIENNE (vê-enn), a western department of France; area, 2690 sq. miles. Iron is abundant, and there are excellent quarries of marble, granite, millstones, whetstones, lithographic stones, and limestone. The manufactures consist of woollens, lace, cutlery, paper, pig-iron, etc. The capital is Poitiers. Pop. 342,785.—Haute-Vienne is a hilly department adjoining Vienna on the southeast; area, 2130 sq. miles. The principal crops are buckwheat, rye, beans, and peas; and horses, mules, and swine of a superior breed are reared. Minerals include iron, copper, tin, lead, coal, antimony, and kaolin. Porcelain,

who were allowed to hold portions of land at the will of their lord, on condition of performing menial and non-military services. It frequently happened that lands held in vilenage descended in uninterrupted succession from father to son, until at length the occupiers or villeins became entitled, by prescription or custom, to hold their lands so long as they performed the required services. And although the villeins themselves acquired freedom, or their land came into the possession of freemen, the villein services were still the condition of the tenure, according to the custom of the manor. These customs were preserved and evidenced by the rolls of the several courts-baron, in which they were entered, or kept on foot by the constant immemorial usage of the several manors in which the lands lay. And as such tenants had nothing to show for their estates but the entries into those rolls, or copies of them authenticated by the steward, they at last came to be called tenants by copy of court-roll, and their tenure a copy-hold.

VILLERS. See Buckingham

VILNA, or WILNA, a town of Russia, capital of the government of the same name, on the Villa. Pop. 154,532.—The government, which lies in the Baltic, has an area of 16,406 sq. miles and a population of 1,591,207. The surface is generally flat, and the government produces good crops of grain, hemp, and flax. Manufactures and trade are limited.

VINCENNES (vín-sēnz'), the county-seat of Knox co., Ind., 117 miles southwest of Indianapolis; on the Wabash river, and on the Cleveland, Cincinnati, Chicago and St. Louis, the Baltimore and Ohio Southwestern, the Evansville and Terre Haute, and the Indianapolis and Vincennes railroad. Pop. 12,249.

VINCENT, St., one of the British West India islands. See St. Vincent.

VINCI (vin'chē), Leonardo da, one of the greatest Italian painters, also distinguished as a sculptor, architect, and civil and military engineer, a scientific inventor, and a man of universal genius, was born at the village of Vinci, near Florence, in 1452. Two of his earlier productions are still extant: The Adoration of the Magi, in the gallery of the



Leonardo da Vinci.

Uffizi at Florence, and The Virgin of the Rocks in the British National gallery. His great painting of the Lord's Supper was finished in 1499. The original has been wholly defaced, but judging from copies and engravings, this work is

universally regarded as one of the greatest ever produced. One of the best copies is that in the Royal academy, London, by his pupil Marco d'Oggionno. After the occupation of Milan by Louis XII. (1499) he retired to Florence, where he painted his celebrated portrait of Mona Lisa del Giocondo, known as La Gioconda, in the Louvre. In 1502 he was appointed chief engineer and architect of the pope's army, and visited many of the fortified posts in the papal dominions. In 1507 he returned to Milan, and painted a Madonna and Child in the palace of the Melzi at Vaprio. In 1512 he painted two portraits of Duke Maximilian, son of Ludovico, and in 1516 accompanied Francis I. to France. He died at Cloux, near Amboise, 2d May, 1519.

VINE, a well-known climbing shrub with woody stems, simple or compound leaves, peduncles sometimes changed into tendrils, small green flowers, and round berries. The species are found in both the Old and New Worlds, especially in Asia. The best known and most useful of the order is the grapevine, cultivated from time immemorial, of which there are numerous varieties, distinguished by possessing lobed sinuately-toothed, naked or downy leaves. It is a native of Central Asia, and its cultivation extends from near 55° north latitude to the equator, but in south latitudes it only extends to about 40°. It is rarely grown at a greater altitude than 3000 feet. About 1771 a European vine was introduced on the Pacific slope, and the culture has increased to great dimensions, especially in California. In other parts of the United States, however, the native American varieties are chiefly cultivated. The vine grows in every sort of soil, but that which is light and gravelly is best suited for the production of fine wines. It is a long-lived plant, indeed, in suitable climates the period of its existence is not known. It is propagated from seeds, layers, cuttings, grafting, and by inoculation, the first method being used for obtaining new varieties. Some vines produce dark-colored berries (black or red so called), others white. The Burgundy may be considered the most general vineyard grape of France, and the best wines in Italy and Spain are also made from grapes of this description. The sweet wines are made from sweet-berried grapes allowed to remain on the plants till overripe. Most varieties of the vine bear only once in the season, some oftener, especially in warm climates. Grapes are extensively used in the dry state under the name of raisins, chiefly imported from Spain and the Levant. The dried currants of commerce are the produce of the small seedless Corinthian grape which is cultivated in Greece and in many of the Greek islands. The vine is mentioned in the most ancient historical records, and the grape has been in use for the making of wine for more than 4000 years. The Phœnicians introduced the vine into Europe. Vineyards are mentioned in Domesday book as existing in England, but in the reign of Henry II. the cultivation of the vine began to be neglected. Artificial heat was not applied to the production of

grapes before the beginning of the 18th century. For the manufacture of wines see Wine.

VINEGAR, the name given to dilute and impure acetic acid, obtained by the vinous fermentation. In wine countries it is obtained from the acetous fermentation of inferior wines, but in Britain and elsewhere it is usually procured from an infusion of malt which has previously undergone the vinous fermentation. Vinegar may also be obtained from strong beer, by the fermentation of various fruits, or of a solution of sugar mixed with yeast; in short, all liquids which are capable of the vinous fermentation may be made to produce vinegar. Vinegars yield by distillation a purer and somewhat weaker acetic acid, called distilled vinegar. Wood vinegar is an impure acetic acid obtained by the distillation of wood. Common and distilled vinegar are used in pharmacy for preparing many remedies, and externally in medicine, in the form of lotions. The use of vinegar as a condiment is universal. It is likewise the antiseptic ingredient in pickles.

VIOL, a class of ancient musical instruments which may be regarded as the precursors of the modern violins. They were fretted instruments with three to six strings, and were played on with a bow. There were three instruments differing in pitch in a set, the treble, tenor, and bass viols, and in concerts they were commonly played in pairs: two treble, two tenor, and two bass. The bass viol, or viol de gamba, was the last to fall into disuse, which it did about the close of 18th century.

VIOLA. See Violin and Violet.

VIOLET (Viola), the popular name given to the species of the natural order Viloaceæ, which are favorite flowers in all northern and temperate climates and many of them among the first to make their appearance in the spring. The corolla is composed of five unequal petals; the roots are mostly perennial; the leaves are alternate and stipulated; and the flowers are pendunculate. More than a hundred specimens are known. The greatest favorites are common sweet violet, heart's-ease; the former being especially esteemed for its fragrance. The well-known pansies so common as garden flowers are but varieties produced by cultivations.

VIOLET, one of the colors. See Color. Spectrum, etc.

VIOLET-WOOD. See King-wood.

VIOLIN, a musical instrument, consisting of four cat-gut strings, the lowest of which is covered with silvered copper wire, stretched by means of a bridge over a hollow wooden body, and played with a bow. It is considered the most perfect of musical instruments, on account of its capabilities of fine tone and expression, and of producing all the tones in any scale in perfect tune. It forms with its cognates, the viola, violoncello or bass violin, and double-bass, the main element of all orchestras. The principal parts of the violin are the scroll or head, in which are placed the pins for tuning the strings; the neck, which connects the scroll with the body, and to which is attached the finger-board, upon which the strings are

VIOLONCELLO

stopped by the fingers of the left hand as it holds the neck in playing; the belly, over which the strings are stretched, and which has two f-shaped sound holes, one on each side; the back or under side; the sides or ribs, uniting the back and belly; the tail-piece, to which the strings are fastened; and the bridge. The back, neck, and sides are generally of sycamore, the belly of deal, the finger-board and tail-piece of ebony. Almost all the different pieces are fastened together with glue. The four strings of the violin are tuned at intervals of fifths, G, on the upper space of the bass staff, D, A, E, reckoning upward. Every intermediate semitone in its ordinary compass of $3\frac{1}{2}$ octaves may be produced by stopping the strings with the fingers, and the compass may be almost indefinitely extended upward by the harmonics produced by touching the strings lightly. The viola, or tenor violin, has four strings tuned C (in the second space of the bass staff), D, A, G, reckoning upward, and is an octave higher than the violoncello, and a fifth lower than the violin. The violin can, to a limited extent, be made to produce harmony by sounding two or three strings together. The finest violins are by old makers, which cannot be imitated, and the precise cause of their superiority has never been satisfactorily explained. The Cremona violins stand in the first rank, the celebrated makers being the Stradivari (Straduarius), Amati, and Guarneri (Guarnerius); of German makers the most celebrated are Stainer or Steiner and Klotz; Vuillaume of the French, and Forest of the English.

VIOLONCELLO, a powerful and expressive bow instrument of the violin kind, held by the performer between the knees, and filling a place between the violin and double-bass. It has four strings, the two lowest covered with silver wire. It is tuned in fifths, C (on the second ledger-line below the bass staff), G, D, A, reckoning upward, and is an octave lower than the viola or tenor violin. Its ordinary compass from C on the second ledger-line below extends to A on the second space of the treble, but soloists frequently play an octave higher.

VIPER, a name applied to various venomous serpents, characterized by having no teeth in the upper jaw save the two hollow poison-fangs. The common viper or adder is generally of a



Head and tail of common viper.

brownish-yellow color, with zig-zag markings and black triangular spots. Its bite is, as a rule, not fatal, but may induce pain, sickness, and fever. The food consists of frogs, mice, birds, eggs, etc. The viper is viviparous—retaining its eggs within the body till the young are hatched.

VIRCHOW (fēr'hō), Rudolf, German pathologist and anthropologist, born

1821, studied medicine at Berlin, and early became famous as a lecturer on pathological anatomy at Berlin university. In 1849 he accepted a chair at Würzburg, where he remained seven years, returning to Berlin in the autumn of 1856 as professor in the university and director of the pathological institute attached to it. He has rendered immense service to medical science by his discoveries in regard to inflammation, ulcerations, tuberculosis, and numerous other morbid processes of the human body, and has had great influence on the whole of modern medicine, including hospital reform and sanitary science.



Rudolf Virchow.

From 1862 he was one of Bismarck's most powerful opponents in the Prussian parliament and the Reichstag, and has been a member of important commissions, etc. In 1856 he was elected an honorary member of the Royal Society of Medicine, London. He was one of the founders of the German Anthropological society, and has been an enthusiastic worker in this field, accumulating facts (partly in company with Schliemann) in Asia Minor, the Caucasus, Egypt and Nubia, etc. He has been a voluminous writer, and among his important works are: *Cellular Pathology*, *Handbuch der Speziellen Pathologie und Therapie*, *Über den Hungertyphus*, *Die Aufgabe den Naturwissenschaften in dem neuen nationalen Leben Deutschlands*, *Die Freiheit der Wissenschaft im Modernen Staat*, and many others. He died in September, 1902.

VIRGIL, full name, Publius Virgilius (or Vergilius) Maro, the most distinguished epic, didactic, and pastoral poet of ancient Rome, was born at Andes (probably Pietola), a little village near Mantua, 15th October, 70 B.C. His *Eclogues*, a series of bucolic or pastoral poems, were written about 41-39 B.C. His *Georgics*, a poem on agriculture, was completed in B.C. 31. The *Æneid*, an epic in twelve books on the fortunes of Æneas, was probably begun about B.C. 29. It occupied the author many years, and never received his finishing touches. In B.C. 20 Virgil appears to have engaged on a tour in Greece. But Augustus, having arrived at Athens on his return from the East, Virgil determined to accompany him home. At Megara, however, he fell sick, and he died at Brundisium, B.C. 19.

VIRGINAL, an obsolete keyed musical instrument with one string, jack and quill to each note. It differed from the spinet only in being square instead of

triangular, and was the precursor of the harpsichord, now superseded by the pianoforte.



Virginal.

VIRGINIA. See Appius Claudius. **VIRGINIA**, one of the original of the United States of North America, bounded by West Virginia, Maryland, the Atlantic, North Carolina, Tennessee, and Kentucky; area, 42,450 sq. miles. It ranks thirty-eight in size among the states. The western portion of the state is traversed from s.s.w. to n.n.e. by the great range of the Alleghanies, with ramifications known by various local names, and intersected by extensive and fertile valleys. The surface of the state may be divided into three sections; the seaboard or tide-water district, the soil of which is of excellent quality, yielding large crops; the district to the



Obverse.



Reverse.

The seal of Virginia.

eastern chain of the Alleghanies, which is less fertile; and the mountain district, which has many rich and fertile valleys. The Valley of Virginia in this district has been called the garden of America. The width of the mountainous district is from 80 to 100 miles. The highest point is White Top, about 6000 feet above sea-level. The sea-board or tide-water district is generally level, not exceeding 60 feet above the tide in its highest parts. Virginia is rich in minerals, including coal, iron, copper, lead, manganese, zinc, gold, gypsum, rock-salt, etc.; the most valuable of those worked being

coal and iron. The chief rivers are the Potomac, the Rappahannock, the York, and the James, which flow into Chesapeake bay. The Roanoke passes into North Carolina. East of the Blue Ridge the climate is mild or temperately warm, with a mean temperature of 37° for January and 77° for July. The rainfall is sufficient throughout the state, and favorably distributed for agriculture. It is greatest in the central portion near Richmond, where the average is 48 inches. The soils of Virginia are in general light and sandy, except in the bottom lands and in the marsh regions, where a deep layer of vegetable mold has accumulated. The forests are still of considerable extent, and consist of yellow pine and cedar, with cypress in the swamps and some oak, hickory, locust, and persimmon. In the western uplands there are large forests of deciduous trees, with white pine on the mountains, and with the general characters of the Appalachian floral region. Virginia ranks close to Massachusetts, New York, New Jersey, and Maryland in the importance of sea fisheries. Oysters constitute two-thirds of the total product. Among other varieties are shad, menhaden, clams, and alewives. The staple products of Virginia are tobacco, Indian corn, wheat, and oats. Cattle and sheep are numerous, and dairy produce is exported. The largest exports are tobacco and flour. Elementary and intermediate education is free to all; advanced instruction is free to a certain number; and the higher instruction of the University of Virginia is free to all male natives over eighteen years of age who possess a certain standard of culture. Among the other institutions are the college of William and Mary, Washington and Lee university, and Richmond college. The chief cities of the state are Richmond (the capital), Norfolk, Petersburg, Lynchburg, Alexandria, and Portsmouth. Virginia was first settled at Jamestown in 1607 and 1609 by chartered London companies. It was made a royal colony in 1624, and continued a loyal royal province till the revolution. Negro slavery was introduced in 1619, and for a considerable period after that date felons or convicts were sent over from England in large numbers, and sold for a term of years for work on the plantations. Virginia has perhaps, the most interesting history of any state in the Union. The first lasting settlement in America was made at Jamestown in 1607 by the English. At this place, also, was held the first representative assembly in America. In the early history of Virginia are found the names of Captain John Smith and Pocahontas. This state took the lead in the protest against the Stamp Act and the encroachments of Great Britain, and in the revolutionary period furnished such noted sons as Washington, Jefferson, Henry, the Lees, and Madison. The surrender of Cornwallis at Yorktown put an end to the war. In the war of 1812, Virginia bore a conspicuous part, as also in that of 1846-47 with Mexico. The civil war was more disastrous in its consequences to Virginia than to any other state of the Union, and on its soil the last battle was

fought and the final surrender was made. Seven of the first twenty-one presidents of the United States were natives of Virginia. The popular name is the Old Dominion. From the beginning the state has been democratic in national politics. The hold was never broken until 1860, when the vote was cast for the Constitutional Union candidate, John Bell. Since its re-admission the vote has been steadily cast for the democratic national candidates, with the exception of 1872, when the republican candidate, Grant, was preferred to his opponent, Greeley, an old abolitionist. Pop. 2,100,000.

VIRGINIA, University of, an undenominational institution of higher learning at Charlottesville, Va., four miles from Monticello, the home of Thomas Jefferson, its founder. It was chartered in 1819 and opened in 1825. The courses of instruction are comprised in five departments: academic, engineering, law, medicine, and agriculture, comprising in all 22 schools, of which each affords an independent course under professors who are responsible only to the board of visitors, appointed by the governor. The courses are purely elective. The degrees of bachelor of arts, law, and science, master of arts, doctor of philosophy, medicine, and law, civil, mechanical, mining, and electrical engineer are conferred only upon examination after residence.

VIRGINIA AGRICULTURAL AND MECHANICAL COLLEGE AND POLYTECHNIC INSTITUTE, an institution founded in 1871 on the land grant of 1862. It offers courses in agriculture, horticulture, applied chemistry, general science, civil, mechanical, and electrical engineering, and shorter courses in practical agriculture and practical mechanics. The sciences hold the foremost place in the curriculum, but every course includes a certain element of general culture. The courses are so arranged as to give the student an approximately equal amount of class work and of laboratory, shop, or field practice. The degrees conferred are bachelor and master of science and civil, mechanical, and electrical engineer. Military drill is required of the students.

VIRGINIAN CREEPER, a climbing plant, native to North America, used as an ornamental covering for walls, etc., and sometimes called American Ivy. Its leaves turn a bright red in the autumn.

VIRGINIAN DEER. See Cariacou.

VIRGINIAN QUAIL. See Quail.

VIRGIN ISLANDS, a group of small islands in the West Indies, belonging to Denmark and Britain, and situated east of Porto Rico. The chief exports are sugar, molasses, rum, cotton, and salt. The chief British islands are Tortola, Anegada, and Virgin Gorda; the Danish are St. Thomas, Santa Cruz, St. John, Culebra, Crab Island, etc. The group was discovered by Columbus in 1494.

VIRGIN MARY. See Mary.

VIRGIN'S BOWER. See Clematis.

VIRUS, the term used in medicine to denote a palpable morbid product causative of a contagious disease. The term virus is used of any one of the infective agents which cause respectively typhus

fever, relapsing fever, scarlet fever, smallpox or measles. Virus is also used as a synonym of lymph, in speaking of vaccine material. We also speak of the virus of syphilis, glanders, hydrophobia, etc., meaning the morbid fluid which contains the germs of these diseases and is capable of propagating them if inoculated into the human body. In this way a culture of any bacteria may loosely be called a virus. The active principle of a virus has the tendency to reproduce itself after a period of variable length, called the period of incubation, which elapses between the time of exposure and inoculation and the day when symptoms of the disease are first noted. In measles the period of incubation is about ten days, though it may be protracted to thirty days; the virus being carried in blood from an exanthematous patch or the secretion from the eyes or nostrils, and later from the scales that separate from the skin. In smallpox the period of incubation is about twelve days, though it varies from five days to three weeks.

VISCACHA (vis-kä'chá), a rodent animal of South America, allied to the chinchilla, about 2 feet long and stoutly built, with a short tail, inhabiting the pampas of the Argentine Republic, and living in burrows like the prairie-dog of North America.

VISCOUNT (vī'kount), a title of nobility next in rank to that of earl, and immediately above that of baron. It is the most recently established English title, having been first conferred by letters patent on John, Lord Beaumont, by Henry VI. in 1440. The title is frequently attached to an earldom as a second title, and is held by the eldest son during the lifetime of the father.

VISHNU, the second god of the Hindu triad (the others being Brahma and Siva), and by his special worshippers considered to be the greatest. In the early Vedas he appeared as a manifestation of the sun, and he was not regarded as the most exalted deity, this rank being accorded to him by the later writers of the Rāmāyana, the Mahābhārata, and



Vishnu on his man-bird garuda.

more especially of the Purānas. The Brahmanic myths relating to Vishnu are characterized by the idea that whenever a great physical or moral disorder affected the world, Vishnu descended in a small portion of his essence to set it right. Such descents are called avatars, or incarnations, and are generally given as ten, nine of which are already past,

the tenth being yet to come. He is generally represented as having four arms, each hand holding some particular object, and as riding on a being half man and half bird.

VISIBLE SPEECH, a term applied by Prof. A. Melville Bell, its inventor, to a system of alphabetical characters designed to represent every possible articulate utterance of the organs of speech. The system is based on an exhaustive classification of the possible actions of the speech organs, each organ and every mode of action having its appropriate symbol. It is said that this invention is of great utility in the teaching of the deaf and dumb to speak, and in enabling learners of foreign languages to acquire their pronunciation from books.

VISIGOTHS. See Goths.

VISION. See Eye, Optics, Sight.

VISTULA (viksél), a river which rises in the Carpathians, traverses Galicia, Poland, and Prussia, and after a course of about 650 miles empties by several mouths into the Gulf of Danzig. It flows past the towns of Cracow, Warsaw, Dromberg, and Danzig, and is navigable from the first-mentioned place.

VITACEÆ. See Vinc.

VITEL'LINE, a substance consisting of casein and albumen, forming the nutritive part of the yolk of birds' eggs.

VITEPSK', or **VITEBSK**, a town in Russia, capital of the government of the same name on the Dūna, 315 miles s. of St. Petersburg. Its manufactures are woolen and linen cloth, leather, and mead. Pop. 57,079.—The government has an area of 17,433 sq. miles. The surface is generally flat, and much occupied by woods and morasses. Pop. 1,201,224.

VITRIOL, BLUE. See Copper.

VITRIOL, Green, the same as copperas or sulphate of iron. See Copperas.

VITRIOL, Oil of, the common name for strong sulphuric acid.

VITTORIA. See Vitoria.

VITUS'S DANCE, St., a spasmodic or convulsive disease, allied to rheumatism, and due to an irritable condition of the spinal cord, in which the muscles of the extremities and other parts are thrown into various involuntary motions, and perform in an irregular manner those motions which are dictated by the will. The disease attacks both sexes, but chiefly the female, and is specially a disease of childhood, occurring in those who are of a weak constitution or improperly nourished. It generally appears from the eighth to the fourteenth year. In serious cases the spasmodic movements are violent and incessant, and speech and swallowing are interfered with.

VIVER'RIDÆ, a family of mammals containing the civits and allied tribes.

VIVIPAROUS ANIMALS, animals which bring forth their young alive. See Reproduction.

VIVISECTION, the practice of operating with the knife upon living animals for the purpose of ascertaining some fact in physiology or pathology which cannot be otherwise investigated. It is also practiced in order to illustrate previously known facts, and to enable students to acquire operative dexterity. Though the term vivisection strictly is applicable to cutting operations only, it

is generally employed for all scientific experiments performed on living animals, whether they consist of cutting operations, the compression of parts by ligatures, the administration of poisons, the inoculation of disease, the subjection to special conditions of food, temperature, or respiration, or to the action of drugs and medicines.

VIZIER, a title given to high political officers in the Turkish empire and other Mohammedan states. In Turkey the title is given to the heads of the various ministerial departments into which the divan or ministerial council is divided. The president of the divan or prime minister is known as grand vizier.

VLADIMIR (vlād-ē'mēr), one of the oldest towns in Russia, capital of a government of the same name, 105 miles n.e. of Moscow. It has a cathedral, a theological seminary, considerable manufactures, and a trade in fruit. During the 13th century it rivaled Moscow in importance, but began to decay in the following century. Pop. 16,422.—The government has an area of 18,794 sq. miles, and a population of 1,339,327.

VLADIVOSTOCK, a Russian seaport in Eastern Siberia, Sea of Japan, a terminus of the great Siberian railway. It was founded in 1861, and is a station of the Russian Pacific fleet. Vast sums have been spent on wharves, ship-yards, and arsenals, but the trade is small. Pop. 29,000.

VOCAL CORDS OR CHORDS. See Voice and Larynx.

VOICE, the name given to the result of the production of sound in nearly all the higher vertebrate animals. "Speech" (which see) is a modification of "voice." In man the voice is produced by the inferior laryngeal ligaments or true vocal cords (see Larynx) as they are termed. The vocal cords consist of two elastic folds of mucous membrane, so attached to the cartilages of the larynx and to muscles, that they may be stretched or relaxed and otherwise altered so as to modify the sounds produced by their vibration. The higher the note produced the greater is the tension of the cords; and the range of voice therefore depends upon the amount of tension which the cords can undergo. Regarding the compass and application of the voice in speaking and singing physiologists have noted three kinds of sequence. In ordinary speaking a monotonous sequence is observed, the notes having nearly all the same pitch, and the variety of the sounds being due rather to articulation in the mouth than to definite movements of the glottis and vocal cords. A passage from high to low notes, without intervals, forms the second kind of sequence; or the same sequence is observed in the passage from low to high notes. Such a sequence is exemplified in crying and howling both in man and in lower animals. The true musical sequence forms the third, in which the successive sounds have vibrations corresponding in relative proportions to the notes of the musical scale. The male voice admits of division into tenor and bass, and the female into soprano and contralto. The lowest female note is an octave or so higher than the lowest note of the male voice, and the female's

highest note is about an octave above that of the male. The compass of both voices taken together is about four octaves, the chief difference residing in the pitch and also in the quality or timbre. The difference of pitch between the male and female voice is due to the length of the vocal cords, while the difference in timbre appears to result from differences in the nature and extent of the walls and cavity of the larynx, throat, and mouth. Chest notes differ from falsetto notes in that the former are natural notes produced by the natural voice, while the latter are produced by a stopping action on the cords. Finally it may be noted that the actual strength of the voice depends on the degree of vibration of the vocal cords, and also in a minor degree on the resonance of the larynx, lungs, and chest generally.

VOLAPUK (vō'la-pūk), the name given to a universal language invented by Johann Martin Schleyer, of Constance, after twenty years labor. The name means "world-speech," being based on English world and speak, and a number of the vocables are modified English words. In structure the language is simple and extremely regular, and the orthography is entirely phonetic, the words being pronounced as they are written, and vice versa. The study of Volapük has made some progress; there are a number of periodicals written in it, and many associations devoted to its dissemination.

VOLATILE OILS. See Oils.

VOLCANOES, in a popular sense, conical hills or mountains composed of material (volcanic ashes and lava) brought up by igneous forces from the interior of the earth through a pipe or vent. At the top there is a cup-shaped hollow called the crater. A volcanic eruption generally commences with the discharge of immense quantities of gases. This is followed by the ejection of ashes and hot fragments of rock. Lastly there is a flood of molten rock or lava. Volcanoes which show such outbursts more or less frequently are called active volcanoes; those which are known



Section of an active volcano.

to have been active in historic times, but have long been quiescent, are called dormant or sleeping volcanoes; and those which present all the phenomena of volcanoes, but which have shown no activity in historic times, are called extinct or dead volcanoes. The mud volcanoes of the Crimea and elsewhere; the fissures from which steam issues; the holes from which sulphurous fumes proceed of Italy, etc.; the geysers and hot springs of Iceland, New Zealand, the Yellowstone park, etc., are signs of

weak or decreasing volcanic activity in the special districts in which they occur. Volcanoes may occur as isolated conical mountains, such as Vesuvius, Etna, or the Peak of Teneriffe. They also form various groups or systems of mountains. One remarkable fact in the distribution of volcanoes is their proximity to the sea, for out of 323 active volcanoes, all, excepting two or three in Central Asia and about the same number in America, are within a short distance of the ocean. An almost uninterrupted line of volcanoes stretches from the 46th degree of s. latitude in Chile to the north of Mexico, including Tunguragua, Coto-paxi, Antisana, Pichincha, Orizaba, Popocatepetl, Jorullo, etc. Another continuous line of volcanic action commences in the north of Alaska, passes through the Aleutian Isles over to Kamtchatka in northeast Asia, then proceeds southward without interruption through a space of between 60° and 70° of latitude to the Moluccas. It includes the Kurile, Japanese, and Philippine islands, traverses Java, Sumatra, Borneo, Celebes, New Guinea, and extends to various parts of the Polynesian archipelago and New Zealand. A volcano in the island of Krakatoa, in the Straits of Sunda, burst into most violent activity on the 26th August, 1883. In the Old World the volcanic region extends from the Caspian sea to the Azores, embracing the greater part of the Mediterranean and its most prominent peninsulas. Here volcanic action is most prominently visible in Vesuvius, Etna, and the Lipari islands. Among disconnected volcanic groups may be mentioned Iceland (Mt. Hecla, in particular), the Sandwich islands, and the islands of Bourbon, Madagascar, and Mauritius. Submarine volcanoes show a frequent existence, but such phenomena are for the most part inaccessible. Various theories have been proposed to account for the immediate cause of volcanic action. It is now generally accepted that it is produced by internal heat at a certain depth beneath the surface of the earth, and the evolution of a great body of elastic vapor, expanding and seeking to escape where the least amount of resistance is presented, and manifesting itself in the explosions that accompany an eruption, or in the upheaval of rocks and the production of earthquakes.

VOLE, a genus of rodents closely allied to the rats and mice, and included in that family. Some are terrestrial,



Common vole.

others aquatic. The common vole of Britain, the meadow-mouse, or short-

tailed field-mouse, is injurious to young plantations and pastures, sometimes appearing in immense multitudes. It is reddish-brown above and gray below. The water-vole or water-rat is much larger, and swims well though its feet are not webbed. It is of a pale or chestnut brown, tinted with gray. There are many species of voles in the Old and New World.

VOLGA, a river in Russia, the longest in Europe; rising in a small lake in the east of the Valdai hills, and falling into the Caspian sea by about seventy mouths, near Astrakhan, after a total estimated course of 2400 miles. Its basin is estimated at from 500,000 to 700,000 sq. miles. It flows generally southeast past Tver, Yaroslav, Kostroma, and Nijni-Novgorod to Kasan, thence south



past Simbirsk and Saratov, and proceeds southeast from Sarepta to the Caspian. Its chief tributaries are the Kama on the left bank and the Oka on the right. It is navigable by barges from its source, and communicates with the Black, Baltic, and Polar seas by a series of canals. Its banks are fertile and well-wooded, and its waters abound in fish, particularly sturgeon, carp, and pike of extraordinary size.

VOLHYN'IA, a government in southwest Russia; area, 27,723 sq. miles. The soil is fertile, producing all kinds of grain, particularly wheat; and fine breeds of cattle and horses are reared. The hills in the south are rich in iron. There are also considerable manufactures. The capital is Jitomir. Pop. 2,997,902.

VOLITION. See Will.

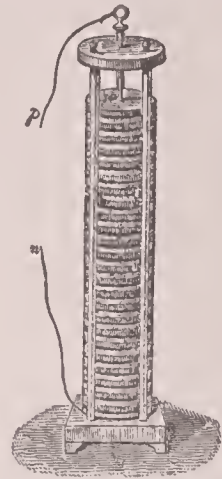
VOLOG'DA, a government in northeast Russia; area, 155,033 sq. miles. Its forests furnish quantities of timber and charcoal. Pop. 1,172,253.—The capital is Vologda, on a river of same name, 35 miles e.s.e. of St. Petersburg. Pop. 17,391.

VOLTA, Alessandro, Italian natural philosopher, born at Como in 1745, and died there in 1827. Two treatises, published in 1769 and 1771, in which he gave a description of a new electrical machine, laid the foundation of his fame. He was successively professor of physics at the gymnasium in Como and in the University of Pavia, where he invented the electrophorus and electro-scope. He also devised several other electrical appliances, and in 1800 the voltaic pile. In 1782 he made a tour through France, Germany, England,

and Holland. In 1801 Napoleon invited him to France, where a medal was struck in his honor. In 1810 he was created a senator of Italy, with the title of count; and in 1815 was made director of the philosophical faculty of Padua.

VOLTAIC ELECTRICITY, galvanic electricity, galvanism. See Galvanic Battery and Galvanism.

VOLTAIC PILE, Volta's arrangement for producing a current of electricity, consisting of a pile of alternate discs of two dissimilar metals, as copper and



Voltaic pile. p, Positive. n, Negative end.

zinc, zinc and silver, zinc and platinum, separated by pieces of flannel or paste-board moistened with salt water or with water acidulated with sulphuric acid.

VOLTAIRE, François Marie Arouet de, French writer, born at Paris, November 21, 1694; died there May 30, 1778. In 1718 a tragedy named *Ceide* was brought out by him, and was a great success. It is said that this play was finished, and that two cantos of his epic the *Henriade* were written in the Bastille where he was confined from May, 1717, to April, 1718, for writing certain satirical verses on the regent. In 1726 he was again imprisoned in the Bastille for sending a challenge to the Chevalier Rohan, by whom he had been grossly insulted. He was liberated within a month, and went to England on the invitation of Lord Bolingbroke. Here he resided till 1729 in friendship with the leading deists, and acquired some knowledge of English literature. His *Henriade* was completed and published by subscription in England. From 1734 to 1749 he resided with the Marchioness de Châtelet at Cirey, in Lorraine. She died in 1749, and Voltaire then accepted the oft repeated invitations of Frederick the Great to come and live at his court at Potsdam. From 1754 he lived in Switzerland, or close to its borders. In 1760 or 1761 he fixed his residence with his niece, Madame Denis, at Ferney, where he received a constant succession of distinguished visitors, and maintained a correspondence which included in its range most of the crowned heads of Europe. In February, 1778, he went to Paris, where he was received with enthusiasm by all classes. But the excitement of the occasion hastened his death. His works embrace almost every branch of literature; poetry, the drama, romance, history, philosophy,

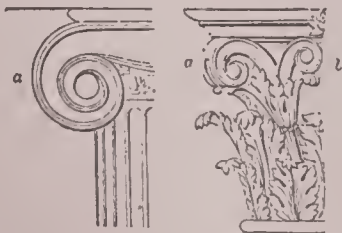
and even science. Hatred of fanaticism and superstition was his chief characteristic, and nearly all his works are strongly animated by a spirit of hostility to the priests and the religion they represented. He upheld theism, however, with as much zeal as he denounced Christianity and priestcraft. Voltaire's literary fame chiefly rests on his philosophical novels: *Zadig*, *Candide*, *L'Ingénu*, etc.; his histories: *Siècle de Louis XIV.*, *Histoire de Charles XII.*; his correspondence; and more than all, perhaps, on his poetical epistles, satires, and occasional light poems, which all exhibit wit, gaiety, vivacity, and grace.

VOLTAMETER, an instrument in which a current of electricity is made to pass through slightly acidulated water, and as the water is thus decomposed, oxygen and hydrogen being liberated, the quantity of electric current passing through in a given time may be ascertained in terms of the quantity of water decomposed.

VOLUNTEERS, citizens who of their own accord offer the state their services in a military capacity without the stipulation of a substantial reward.

VOLUNTEERS OF AMERICA, The, this organization is a philanthropic, social, and religious movement. It was inaugurated in March, 1896, and incorporated November 6, 1896, by Gen. and Mrs. Ballington Booth, in response to a number of requests on the part of American citizens. It is organized in military style, having as its model the United States army, but in conjunction with military discipline and methods of work it possesses a thoroughly democratic form of government, having a constitution and its by-laws being framed by a grand field council that meets annually and is thoroughly representative. The volunteers have representatives and branches of their benevolent work in almost all the principal cities of the United States. Its field is divided into regiments or sections, which come under the control and oversight of thirty principal staff officers, its chief centers being New York, Philadelphia, Boston, Pittsburgh, Denver, Chicago, and San Francisco. In addition to the Volunteer reading rooms, thousands of copies of Christian literature are circulated in state prisons, jails, hospitals, soldiers' homes, and children's homes. In connection with the Volunteers, there are also sewing classes; hospital nurses; temporary financial relief departments; boys' fresh-air camps; Thanksgiving and Christmas dinners, and many other worthy undertakings.

VOLUTE, in architecture, a kind of spiral scroll used in the Ionic, Corinthian



Volutes of the Ionic and Corinthian capitals.
a a, Volutes. b, Helix.

and Composite capitals, of which it is a principal ornament. The number of

volutes in the Ionic order is four. In the Corinthian and Composite orders they are more numerous, in the former being accompanied with smaller ones, called helices. See Composite Order, Corinthian Order, Ionic Order.

VOMER, in anatomy, one of the bones of the skull, forming in man part of the septum or division between the cavities of the nostrils. In fishes it is a feature of importance for classification purposes.

VOORHEES, Daniel Wolsey, American politician, was born in Butler co., Ohio, in 1827. He became early interested in politics, and gained a wide reputation as a democratic campaign speaker. He was United States district attorney for Indiana from 1858 to 1861, and was a member of congress from 1861 to 1867 and again from 1869 to 1875. In 1877 he was appointed United States senator to fill the unexpired term of Oliver P. Morton, and was regularly elected in 1879, 1885, and 1891. He died in 1897.

VORARLBERG, a western district of Austria-Hungary, officially included in the Tyrol. Area, 1005 sq. miles; pop. 107,373.

VORONEJ, a town of Russia, capital of the government of the same name, on the Voronej, 290 miles s.e. of Moscow. It has manufactures of woolen and linen cloth, soap, and vitriol, tanneries, and a considerable trade. Pop. 84,146. The government has an area of 25,440 sq. miles, and a pop. of 2,546,255. It is intersected by the Don, which receives the whole of the drainage, partly through its tributaries the Voronej and Khoper. The soil is generally fertile, and large crops of grain are raised.

VORTEX, the form produced when any portion of a fluid is set rotating round an axis. Familiar examples are seen in eddies, whirlpools, waterspouts, whirlwinds, and on a larger scale in cyclones and storms generally. Descartes supposed certain vortices to exist in the fluid or ether of space endowed with a rapid rotatory motion about an axis, and filling all space, and by these he accounted for the motions of the universe.

VORTEX RING, in physics, a vortical molecular filament or column returning into itself so as to form a ring composed of a number of small rotating circles placed side by side, like beads on a string, as the singular smoke-rings which are sometimes produced when a cannon is fired, or when a smoker skillfully emits a puff of tobacco smoke. Recent investigations of the motion of vortices have suggested the possibility of founding on them a new form of the atomic theory.

VORTICELLA, or "BELL-ANIMALCULE," a genus of stalked infusoria, having a fixed stem capable of being coiled into a spiral form, and vibratile organs called cilia fringing the bell-shaped disc or head, which are constantly in rapid motion and attract particles of food. The species are very numerous in fresh water, and are generally microscopic.

VOSGES, an eastern frontier department of France; area, 2268 sq. miles. It is bounded on the east by the Vosges mountains, which send out ramifications

over the greater part of its surface, while in the south it is traversed by the chain of the Faucilles. Grain, hemp, flax, and potatoes are extensively grown, and the department is famous for its kirsch-wasser. The principal rivers are the Meuse, Mouzon, Madon, Moselle, Saône, and Meurthe; all unnavigable within the department. The minerals are valuable. The manufactures are various. Epinal is the capital. Pop. 413,707.



Vorticellæ.

VOTER, the qualifications required of voters in political elections varies somewhat in the different states. Certain qualifications are required in all states, which may be summarized as follows: (1) Citizenship; (2) residence for a certain time in the state, county, and election district; (3) that the voter shall have attained his majority (21 years); (4) that the voter shall be of sound mind; (5) that he shall not be a convicted felon under sentence. Registration is also required in many states and some have established either property or educational qualifications. A few states permit women to vote.

VOTING MACHINE, a mechanical device which automatically records and counts votes. Besides preventing repeating and other fraud, an ideal voting machine has the additional advantages over the paper ballot system of greater secrecy, simplicity, rapidity, and cheapness. The Standard voting machine is about 4 feet square and 10 inches deep, and is supported by legs. The top is a little over 6 feet from the floor. A semi-circular bar projects from the upper corners, on which is hung a curtain which forms a booth. An operating lever extends from the center of the top of the machine, the outer end of which is attached to the curtain. When the voter advances to vote he throws the lever by a dependent handle to the opposite side of the machine, thus carrying the curtain behind him and inclosing himself in a booth. The voter first selects his party ticket, and by pulling the straight ticket knob over the party emblem down to the right, moves all the pointers for that ticket. If he desires to split his ticket, he can move the pointer back from over the name that does not suit him, and in the same office line move the pointer over the name he wishes to vote for. He now registers his vote by throwing the curtain open by means of the operating lever with which he closed it, thus casting and counting his vote in perfect secrecy.

VOWEL, a simple articulated sound, which is produced merely by voice proceeding from the larynx, modified by a greater or less elevation or depression,

expansion or contraction of the tongue, and contraction or expansion of the lips. The vowel sounds of the English alphabet are imperfectly represented by five letters, a, e, i, o, u (and sometimes w and y). Vowels are distinguished from consonants in that they result from an open position of the vocal organs, while consonants are the result of an opening or shutting action of the organs; thus the former can be pronounced by themselves, while consonants require to be sounded with the aid of a vowel.

VULCAN, in Roman mythology, the god who presided over fire and the working of metals, and patronized handicraftsmen of every kind. By some



Vulcan, from an antique.

writers he is said to have been born lame, but by others his lameness is attributed to his having been thrown from Olympus. He was completely identified with the Greek Hephæstus.

VULCANITE, a kind of vulcanized caoutchouc, differing from ordinary vulcanized caoutchouc in containing a larger proportion of sulphur—from 30 to 60 per cent—and in being made at a higher temperature. It is of a brownish-black color, is hard and tough, cuts easily, and takes a good polish, on which account it is largely used for making into combs, brooches, bracelets, and many other ornaments. As it is especially distinguished by the large quantity of electricity which it evolves when rubbed, it is much used in the construc-

tion of electric machines. See Vulcanization.

VULCANIZATION, a method of treating caoutchouc or india-rubber with sulphur to effect certain changes in its properties, and yield a soft (vulcanized india-rubber) or a hard (vulcanite) product. Other ingredients, as litharge, white-lead, whiting, etc., are added to the sulphur to give color, softness, etc. The substance thus formed possesses the following properties: it remains elastic at all temperatures; it cannot be dissolved by the ordinary solvents, neither is it affected by heat within a considerable range of temperature; finally, it acquires extraordinary powers of resisting compression, with a great increase of strength and elasticity. See Vulcanite and India-rubber.

VULGAR FRACTIONS. See Fractions.

VULGATE, the Latin translation of the Bible, which has, in the Roman Catholic church, official authority, and which the Council of Trent, in their fourth session, in May 27, 1546, declared "shall be held as authentic in all public lectures, disputations, sermons, and expositions; and that no one shall presume to reject it, under any pretense whatsoever." In the early period of the church a Latin translation of the Scriptures existed, called Itala, the Old Testament made after the Septuagint. This translation was far from accurate, and about 383 St. Jerome produced a revised version of the New Testament, while between 385-405 A.D. he made a new translation of the Old Testament from the Hebrew. These translations were combined to form the Vulgate (versio vulgata, common or usual version). The text of the Vulgate now in use is that published by Clement VIII. in 1592 (as improved in 1593 and again in 1598).

VULTURE, the common name for the raptorial birds belonging to the family Vulturidæ, characterized by having the head and part of the neck destitute of feathers, and a rather elongated beak, of which the upper mandible is curved at the end. The strength of their talons does not correspond with their size, and they make more use of their beak

than of their claws. In general they are of a cowardly nature, living chiefly on dead carcases and offal. Unlike other birds of prey the female is smaller than the male. Their geographical distribution is confined chiefly to warm countries, where they act as scavengers to purify the earth from the putrid carcases with which it would otherwise be



Egyptian vulture.

enumbered. The griffon vulture inhabits the mountainous parts of the south of Europe, as does also the cinereous or brown vulture. The former measures nearly 4 feet from tip of beak to end of tail. The bearded vulture inhabits the Alps, Asia, and Africa. The Egyptian vulture visits south Europe. The American vultures differ from those of the Old World technically rather than in appearance or habits. They include the huge condor, king, and California vultures, and several other species, among them the smaller carrion-crow of the tropics, and the more familiar turkey-buzzard. This bird is about 30 inches in length, with an alar spread of about 75 inches; in color dingy brown; the tail is long, the wing is bent at a salient angle, and the tips of the longest quills spread apart and bend upward. No birds are better flyers or more expert and enduring in soaring. The eggs are one or two in number, roundish, about 2½ inches in longest diameter, and yellowish white blotched with brown and purplish tints.

W

W, the twenty-third letter of the English alphabet, representing a consonantal sound formed by opening the mouth with a contraction of the lips, such as is performed in the rapid passage from the vowel sound u (oo) to that of i (ee). The character is formed, as its name indicates, by doubling the u or v. At the end of words or syllables it is either silent, as in low, or it modifies the preceding vowel, as in new, how, having then the power of a vowel.

WABASH (wa'bash), a river of the United States, which rises in the n.w. of Ohio, winds across Indiana, forms the boundary between Indiana and Illinois, and falls into the Ohio after a course of 550 miles. It is navigable for steamboats to Lafayette, and connects Lake Erie with the Ohio by the Wabash and Erie canal.

WACO, a town in McLennan co., Texas. It is situated on the Brazos river; and as the center of a large and fertile ranching and wheat growing district, it commands a large and increasing trade in cattle, wheat, and other agricultural products. Pop. 22,866.

WADA'I, or **WADAY'**, an extensive and powerful negro state in the Central Soudan, between Kanem and Bagirmi in the w. and Darfur in the e., with a population estimated at about 5,000,000. It consists principally of an elevated plateau, very fertile in some parts, producing abundantly corn, millet, indigo, cotton, etc. Ivory and slaves are also largely dealt in. The inhabitants are warlike, and their sultan exercises tributary rights over several neighboring settlements.

WADE, Benjamin Franklin, American

political leader, was born near West Springfield, Mass., in 1800. He removed to Ohio in 1821. He was elected prosecuting attorney of Ashtabula county in 1835, and state senator in 1837 and 1841; and was chosen presiding judge of the third judicial district of the state in 1847. From 1851 until 1869 he was a member of the United States senate. He was elected president of the senate in 1867, and was sent in 1871 as one of the commission to Santo Domingo to report in regard to its annexation to the United States. He died in 1878.

WAFER, a thin circular cake of unleavened bread, generally stamped with the Christian monogram, the cross, or other sacred symbol, used in the Roman church in the administration of the Eucharist.—Also a small disc of dried paste usually made of flour and water,

gum, and coloring matter, used for sealing letters, etc.

WAGNER (väh'nér), Wilhelm Richard, one of the most celebrated of modern composers, born at Leipzig 1813, died at Venice 1883. He received his education at Leipzig and Dresden. From 1834 he filled various musical engagements at Magdeburg, Riga, and Königsberg. In 1839-41 he went to Paris and London, and composed his operas *Rienzi* and *the Flying Dutchman*. The brilliant success of these operas secured him the conductorship at the Royal Opera of Dresden in 1843. He joined the insurrectionary movement of 1848-49, and was compelled to exile himself. Until his return to Germany in 1864 he spent most of his time in Switzerland, Italy, Paris, and London. His *Tannhäuser* and *Lohengrin* appeared in 1845 and 1850 respectively. The late King of



Wilhelm Richard Wagner.

Bavaria, Louis II., became an enthusiastic and liberal patron of Wagner, and the theater at Baireuth, especially built for Wagner, was chiefly supported from the king's purse. Here his famous tetralogy *Der Ring des Nibelungen*, consisting of *Das Rheingold*, *Die Walküre*, *Siegfried*, and *Götterdämmerung*, was first performed in 1876 before an unusually brilliant and appreciative audience. About a year before his death he produced his last creation, *Parsifal*. In 1870 he had married, as second wife, Cosima von Bülow, a daughter of the Abbé Liszt. Wagner labored to reform dramatic music according to the ideas of Gluck and Weber, and gave his creations a national character by selecting his subjects from old German heroic legends. His theory (not in itself specially original) was that in a perfect musical drama the three arts, poetry, music, and dramatic representation should be welded together into one well-balanced whole. This theory he demonstrated with consummate ability and unsurpassed magnificence. His particular views on music are embodied in a well-known work entitled *Oper und Drama*.

WAGTAIL, a name of birds included in the family of the warblers, and so termed from their habit of jerking their long tails when running or perching. They inhabit meadow-lands and pastures, frequent water-pools and streams, are agile runners, and have a rapid flight. The food consists of insects. Their nests, built on the ground, contain from four to six eggs. These birds belong to both Old and New Worlds, and migrate southward in winter.

WAINWRIGHT, Richard, American naval officer, was born in Washington, D. C., in 1849, became a lieutenant in 1873, commanded the coast-survey vessel *Arago* for a time, and was promoted to the rank of lieutenant-commander in 1894. He was executive officer of the battleship *Maine*, when that vessel was destroyed in Havana harbor. In the Spanish-American war he commanded the converted yacht *Gloucester*, taking a distinguished part in the naval battle of Santiago. In March, 1899, he was promoted to the rank of commander, and in March, 1900, became superintendent of the United States Naval academy.



Quaketail, or pied wagtail.

WAITE, Morrison Remick, American jurist, was born at Lyme, Conn., in 1816. In 1849 he was elected to the Ohio legislature as a Whig. In 1871 he was appointed with Caleb Cushing and William M. Evarts to represent the United States before the tribunal for the arbitration of the Alabama and other claims at Geneva, Switzerland. In 1873 he was president of the Ohio Constitutional convention. In January, 1874, he was appointed by President Grant chief justice of the United States. This position he held until his death in 1888.

WAKE, a term corresponding originally to vigil, and applied to a festival held on the anniversary of the day on which the parish church was consecrated and dedicated to a saint. A lyke or lieh wake (Anglo-Saxon, *lic*, a corpse) is the watching of a dead body by night by the relatives and friends of the deceased. The practice, once general, is now confined to the lower Irish classes, and frequently accompanied by scenes much out of keeping with the sad occasion.

WALDECK AND PYRMONT, a small principality of west Germany, under Prussian administration, consisting of the two separate territories of Waldeck and Pyrmont; total area, 466 sq. miles; pop. 56,575.

WALDECK-ROUSSEAU (vâl'dek' rô'sô'), Pierre Marie Ernest, French statesman, born at Nantes in 1846. In 1879 he was elected deputy for Rennes; was minister of the interior in Gambetta's grand ministère of 1881, and in the cabinet of Jules Ferry of 1883-85. In 1894 he was elected to the senate for the department of the Loire, and in the following January he was supported by the right for the presidency of France against MM. Faure and Brisson. In the general election of 1902 he won a great victory for republican principles. Feeling his task completed, he resigned in June, 1902, with the prestige of having held office longer than other premier since the establishment of the third republic.

WALES, a principality in the southwest of the island of Great Britain, which since Edward I. gives the title of Prince of Wales to the heir-apparent of the British crown; area, 7363 sq. miles; pop. 1,720,609. It is rich in minerals, particularly coal, iron, copper, and even gold, and to these Wales owes its chief wealth. The coal trade is most extensive, and Cardiff is the largest coal port in the world. Iron, steel, and copper works are also on a large scale. Besides the mineral industries, there are considerable woolen manufactures, especially of flannel, coarse cloth, and hosiery. The inhabitants are almost purely Celtic in race, being the descendants of the early Britons, who were able to maintain themselves here when the rest of the country was overrun by the Germanic invaders.

WALHALLA, a magnificent Doric temple, on the Danube, near Ratisbon; built between 1830-42, as a national pantheon, consecrated to celebrated Germans of all walks of life. The idea of the erection is derived from the Walhalla, or Valhalla, the ancient paradise of Odin and the Scandinavian deities. See Valhalla.

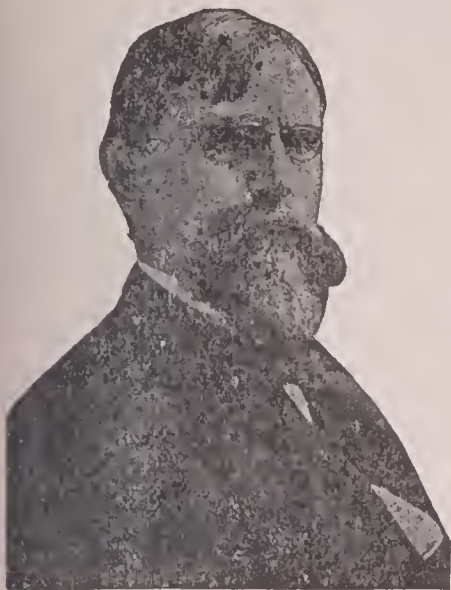
WALKER, Robert James, American political leader, was born at Northumberland, Pa., in 1801. In 1826 he removed to Mississippi and in 1835 was elected United States senator as a democrat, and at once became known as one of the foremost anti-slavery advocates in his party. From 1845 to 1849 he was secretary of the treasury. The tariff bill of 1846 was adopted almost as it came from his hands. In 1853 he declined the post of commissioner to China, and in 1857, against his will, was appointed governor of Kansas territory. He died in 1869.

WALLABY, a name common to several rather small-sized kangaroos.

WALLACE, Alfred Russell, naturalist, born at Usk, Monmouthshire, in 1823. He spent many years in traveling, especially in South America and the Asiatic islands, and the valuable material collected in these scientific explorations he embodied in *Travels on the Amazon* and *Rio Negro*, *The Malay Archipelago*, *Tropical Nature*, *The Geographical Distribution of Animals*, etc. His observation of animal life early led him on to the track of natural selection, and before Darwin gave his famous work to the world he had published his *Speculations on the Origin of Species*. His share in establishing the theory has been acknowledged by Darwin. But while Darwin, in his later editions of the *Origin of Species*, somewhat modified his original conclusions, Wallace, in his recent work, *Darwinism*, an *Exposition of the Theory of Natural Selection*, with some of its *Applications* (1889), strongly insists upon the complete controlling power of these primary laws and conditions. He is a member of various scientific bodies, and the Royal Society of London awarded him the royal medal in 1868, and the Geographical Society of Paris the gold medal in 1870.

WALLACE, Lewis, American soldier and novelist, known as Lew Wallace, was born in Brookville, Ind., in 1827. He served in the Mexican war, and then

practiced law until the civil war. He served as colonel of a regiment of Indiana volunteers in West Virginia in



Lew Wallace

1861, and on September 3, 1861, was promoted to the rank of brigadier-general of volunteers. He was governor of New Mexico (1878-81) and United States minister to Turkey (1881-85). Among his novels are: *The Fair God* and *The Prince of India*. *Ben Hur*, a story of Palestine and Rome in the time of Christ, achieved an unprecedented success and was dramatized (1900). Wallace was also the author of *The Boyhood of Christ*. He died in 1905.

WALLACE, Sir William, the hero of Scottish independence, was probably born about 1270. For the most detailed particulars we possess about this famous Scottish character we are almost entirely dependent on *Blind Harry* (*Harry the Minstrel*); but the narratives cannot bear the scrutiny of the critical historian. Wallace is described as a man of herculean proportions and strength, and it is certain that he possessed in a high degree the qualifications of a commander. The turning-point in his career took place by the slaughter of *Haselrig* in revenge for the murder of his wife, and in pursuance of his vow of eternal vengeance against the invaders of his country. Henceforth he continued in open resistance to the English, and having collected a considerable force was besieging the castle of Dundee when he heard that Surrey and Cressingham were advancing upon Stirling with a large army. He met them in the vicinity of that town, and, thanks to his ingenious military tactics, gained a complete victory (1297). After this Wallace appears with the title of Guardian of the Kingdom, which was temporarily cleared of the English, and is found conducting a series of organized raids into England. In 1298 Edward I. entered Scotland with an army estimated at nearly 90,000 men. Wallace retired before him, wasting the country, but was at length overtaken at Falkirk, compelled to fight, and after a gallant resistance his army was routed. Wal-

lace was conveyed to London, and after a mock trial found guilty of treason and rebellion, and executed on the 23d August, 1305.

WALLACE, William Vincent, musical composer, was born of Scotch parents, at Waterford 1814, died in France 1865. In 1845 he went to London, and devoted himself to composition. His first opera, *Maritana*, was produced at Drury Lane, 1846, and secured him at once a reputation.

WALLENSTEIN (vál'en-stin), Albrecht Wenzel Eusebius, von, Duke of Friedland, a famous leader in the Thirty Years' war, was born on the paternal estate of Hermanic in Bohemia 1583, assassinated at Eger 1634. When the Thirty Years' war broke out in Bohemia (1618) he joined the imperial forces against his native country. His estates, valued at 30 million florins, he was allowed to form into the territory of Friedland, and in 1624 he was created Duke of Friedland. He raised a large army to assist the emperor against the Lower Saxon League; he defeated Count Mansfield at Dessau (April, 1626), and compelled Bethlen Gabor to conclude a truce; he conquered Silesia, and bought from the emperor, partly with military services, partly with plunder, the duchy of Sagan, and other extensive estates. He encountered the King of Sweden at Lützen, 16th November, 1632, and was defeated and Gustavus killed. Wallenstein had unsuccessfully treated on his own account with the Swedish king, and he now secretly reopened negotiations with France and the German princes, occasionally taking the field to display his military power. The court at Vienna was well aware of his crafty diplomacy, but the emperor was not strong enough to remove him, and he had recourse to assassination. This was accomplished for him at Eger, where Wallenstein had retreated for safety, by Colonel Gordon, commandant of the fortress, and his fellow officers Butler, Leslie, and Devereux. Wallenstein is the subject, and gives the title to one of Schiller's best dramatic poems.

WALLA WALLA, the capital of Walla Walla co., Wash.; on the Walla Walla river, and the Wash. and Col. River and the Oregon Railway and Nav. Co.'s railways; 75 miles w.s.w. of Lewiston, Id., and 160 miles e. by n. of The Dalles, Ore. It is in an agricultural, fruit-growing, and stock-raising region, and is the trade center of that part of the state of northern Idaho, and of northeastern Oregon. Among the public buildings are those comprising the United States military post, Port Walla Walla, the state penitentiary, and the United States penitentiary. Pop. 12,119.

WALLFLOWER. They are biennial or perennial herbs or undershrubs. Many of them exhale a delicious odor, and are great favorites in gardens. The best known is the common wallflower, which, in its wild state, grows on old walls and stony places. In the cultivated plant the flowers are of more varied and brilliant colors, and attain a much larger size than in the wild plant, the flowers of which are always yellow. A number of distinct varieties have been recorded, and double and

semi-double varieties are common in gardens.

WALNUT, the common name of trees and their fruit of the genus *Juglans*, natural order Juglandaceæ. The best known species, the common walnut-tree, is a native of several Eastern countries. It is a large handsome tree with strong spreading branches. The timber of the walnut is of great value, is very durable, takes a fine polish, and is a beautiful furniture wood. It is also employed for turning and fancy articles, and especially for gun-stocks, being light and at the same time hard and fine grained. The ripe fruit is one of the best of nuts, and forms a favorite item of desert. They yield by expression a



Walnut.

bland fixed oil, which, under the names of walnut-oil and nut-oil, is much used by painters, and in the countries in which it is produced is a common article of diet. In copper-plate printing it is employed to produce a fine impression, either in black or colors. By boiling the husks when beginning to decay, and the bark of the roots, a substantial dark-brown color is obtained, which is used by dyers for woollens, and also by cabinet-makers to stain other species of wood in imitation of walnut. The fruit, in a green state, before the shell hardens, is much used for pickling. The black walnut is found in most parts of the United States of America, and in favorable situations the trunk often attains the diameter of 6 and 7 feet. It yields a wood preferable to the European walnut, but the nuts are inferior. The butternut is another noteworthy variety.

WALPOLE, Sir Robert, Earl of Orford, a great whig statesman, was born in 1676, and died in 1745. In 1702 he was elected for King's Lynn, became an active member of the Whig party, and soon distinguished himself by his business capacity, and by his easy, plausible, and dispassionate debates. He was secretary of war and leader in the commons in 1708, paymaster of the forces in 1714 and 1720, and first lord of the treasury and chancellor of the exchequer in 1715, and again in 1721. From the latter date until 1742 he held without interruption the highest office in the state. During his long administration the Hanoverian succession, to which he was zealously attached, became firmly established, a result to which his prudence and political sagacity

WALRUS

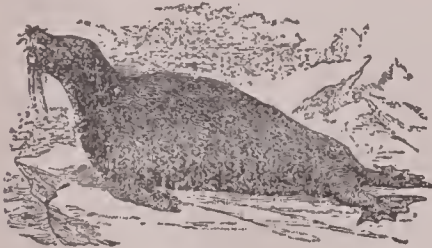
largely contributed. He promoted by an enlightened policy the commercial prosperity of the nation, and relieved



Sir Robert Walpole.

the weight of taxation by many improvements in the tariff. In 1724 he was made a Knight of the Bath, in 1726 a Knight of the Garter, and on 9th February, 1742, two days before his resignation, he was created Earl of Orford.

WALRUS, a marine carnivorous mammal, belonging, with its allies the seals, to the pinnigrade section of the order Carnivora. The walrus, which is also known as the morse, sea-horse, and sea-cow, has a general resemblance to the seals, but is especially remarkable from the upper canine teeth being enormously developed in the adults, constituting two large pointed tusks directed downward and slightly outward, and measuring usually 12 to 15 inches in width,



Walrus.

sometimes even 2 feet and more. There are no external ears. The animal exceeds the largest ox in size, attaining a length of 20 feet. It is monogamous, and seldom produces more than one young at a birth; gregarious but shy, and very fierce when attacked. It inhabits the high northern latitudes, where it is hunted by whalers for its blubber, which yields excellent oil; for its skin, which is made into a durable leather; and for its tusks. Their favorite food consists of crustaceans.

WALSALL', a parl., county, and municipal borough of England, in the county of Stafford, 8 miles n.n.w. of Birmingham. Pop. 86,440.

WALTHAM, a town in Massachusetts, 9 miles west of Boston. The Charles river supplies abundant waterpower to its factories of watches, watch-tools, and cottons. Pop. 27,576.

WALTHAMSTOW, a town and parl. div. of Essex, on the n.e. of London. Pop. of town, 95,125.

WALTON, Izaak, the author of the famous *Complete Angler*, was born at Stafford 1593, died at Winchester 1683.

His first edition of the *Complete Angler* appeared in 1653. It is to his exquisite delineations of rural scenery, his genuine love for the Creator and his works, the ease and unaffected humor of the dialogue, and the delightful simplicity and purity of his style, that the *Complete Angler* owes its charm.

WALTZ, a dance of Bohemian origin, executed with a rapid wheeling motion, the gentleman having his arm round his partner's waist. The music is written in triple time in crotchets or quavers, and consists of eight or sixteen bar phrases. Several of these phrases are now usually united to prevent monotony. The valse à deux temps is a form of waltz in which two steps are made to each bar of three beats. Classical waltzes are compositions in waltz form not intended for dance tunes.

WANDERING JEW. See Jew, The Wandering.

WANDEROO, a monkey inhabiting Ceylon and the East Indies. The length is about 3 feet to the tip of the tail, which is tufted, and much resembles that of the lion; the color of the fur is



Wanderoo.

deep-black; the callosities on the hinder quarters are bright pink; a well-developed mass of black hair covers the head, and a great grayish beard rolls down the face and round the chin.

WAPITI, a species of deer, the North American stag, which more nearly re-



Wapiti, or American elk.

sembles the European red-deer in color, shape, and form than it does any other

WAR

of the cervine race, though it is larger and of a stronger make, its antlers also being larger. It is found in Canada and the northern parts of the United States from the Atlantic to the Pacific. Its flesh is not much prized, being coarse and dry, but its hide is made into excellent leather.

WAR, a contest between nations or states (international war), or between parties in the same state (civil war), carried on by force of arms, usually arising in the first case from disputes about territorial possessions and frontiers, unjust dealings with the subjects of one state by another, questions of race and sentiment, jealousy or military prestige, or mere lust of conquest, rarely nowadays from the whim of a despot; in the second case, from the claims of rival contenders for supreme power in the state, or for the establishment of some important point connected with civil or religious liberty. In all cases the aim of each contending party is to overthrow or weaken the enemy by the defeat or dispersion of his army or navy, the occupation of important parts of his country, such as the capital or principal administrative and commercial centers, or the ruin of his commerce, thus cutting off his sources of recuperation in men, money, and material. International or public war is always understood to be authorized by the monarch or sovereign power of the nations; when it is carried into the territories of a hitherto friendly power it is called an aggressive or offensive war, and when carried on to resist such aggression it is called defensive. Previous to the outbreak of hostilities between states, the power taking the initiatory step issues a declaration of war, which now usually takes the form of an explanatory manifesto addressed to neutral governments. During the progress of the struggle certain laws, usages, or rights of war have come to be generally recognized; such laws permitting the destruction or capture of armed enemies, the destruction of property likely to be serviceable to them, the stoppage of all their channels of traffic, and the appropriation of everything in an enemy's country necessary for the support and subsistence of the invading army. On the other hand though an enemy may be starved into surrender, wounding, except in battle, mutilation, and all cruel and wanton devastation, are contrary to the usages of war, as are also bombarding an unprotected town, the use of poison in any way, and torture to extort information from an enemy; and generally the tendency in all laws and usages of war is becoming gradually more favorable to the cause of humanity at large. See also International Law.

WAR, Department of, an executive department of the United States government, created by act of congress of August 7, 1789. It has at its head a secretary appointed by the president. He ranks third among the cabinet members in the line of succession to the presidency and receives a salary of \$12,000 per year. He has charge of all matters relating to military affairs, subject to the direction of the president, the distribution of stores, the signal

WARBLERS

service, the survey and improvement of harbors, and the administration of the insular possessions. The business of the war department is distributed among a number of subdivisions or bureaus, each of which is under the supervision of a chief and under the general supervision of the chief of staff.

WARBLERS, the name applied to a family of denti-rostral insectorial birds, generally small, sprightly, very shy, and



Yellow warbler or summer yellow-bird, male. remarkable for the clearness, sweetness, and flexibility of their song. Insects form their food, and most of them are migratory.

WAR COLLEGE, United States Army, an organization having for its object the direction and coördination of the instruction in the various service schools, the extension of the opportunities for investigation and study in the army and militia of the United States, and the collection and dissemination of military information. The college, which is located at Washington, is under the immediate direction of the secretary of war and the general staff of the army. The Naval War college is located at Newport, R. I. See Naval Schools of Instruction.

WARD, Artemus. See Browne, C. F.

WARD, Elizabeth Stuart (Phelps), American author, was born in Andover, Mass., in 1844. Among her works the most popular are: *The Gates Ajar*, *Beyond the Gates*, *The Gates Between*, and *Within the Gates*.

WARD, Frederick Townsend, American military adventurer, was born at Salem, Mass., in 1831. He became a sailor, fought with the French in the Crimea, and was with Walker in Nicaragua, and went to China during the Taiping rebellion. Ward offered his services to the Chinese authorities, and for a reward of \$200,000 recaptured Sungkiang and garrisoned it. He began drilling natives with foreign adventurers as officers, increased his following to nearly 4000, the nucleus of the force later known under Gordon as "the ever-victorious army." This force was of great assistance to the British and French admirals in protecting Shanghai, and maintaining a neutral belt of 30 miles around the city. During a skirmish near Ningpo Ward was killed; he was buried at Sungkiang, where a shrine was erected to his memory in 1875.

WARD, John Quincy Adams, American sculptor, was born at Urbana, Cham-

paign co., Ohio, in 1830. In 1857-59 he resided in Washington, D. C., where he executed the busts of Alexander Stephens, Joshua R. Giddings, John P. Hale, Hannibal Hamlin, and others. Among his memorial statues are the colossal George Washington on the steps of the treasury building, New York, General Thomas in Washington, Israel Putnam, Hartford, Conn., and the Beecher monument, city hall, Brooklyn. He was one of the founders and the first president of the National Sculpture society. He was also prominent in the affairs of the National Academy of Design, of which he was president in 1874.

WARD, Lester Frank, American geologist and paleontologist, well known as a sociologist and philosophical writer, was born at Joliet, Ill., in 1841. In 1883 he published *Dynamic Sociology*. As a contribution to sociology it was recognized as a powerful and original work. His other works are: *The Psychic Factors of Civilization*, *Outlines of Sociology and Pure Sociology*. In 1903 he was president of the *Institut Internationale de Sociologie* of Paris. Among his contributions to geology and paleontology are: *The Flora of Washington*, *Sketch of Paleontological Botany*, *Synopsis of the Flora of the Laramie Group*, *Types of the Laramie Flora*, and *Geographical Distribution of Fossil Plants*.

WARD, Mrs. Mary Augusta, novelist, granddaughter of Dr. Arnold of Rugby, born 1851, married 1872 Thomas Humphry Ward. Her chief works are *Robert Elsmere* (1888), a novel of religious doubts and perplexities; *The History of David Grieve*, *Marcella*, *Sir George Tressady*, *Eleanor*, *Lady Rose's Daughter*, etc.

WARM-BLOODED ANIMALS. See Animal.

WARMING AND VENTILATION. The condition of the atmosphere of our houses and apartments is of such importance to health and vigor of mind that warming and ventilation, two closely allied subjects, are receiving more and more attention as sanitary science advances. Their neglect has been the cause, and is still responsible, for an incalculable amount of human disease and suffering. The body, to remain in health, requires a certain degree of heat; so that, if the surrounding atmosphere is too low in temperature, artificial means must be employed to raise it. The temperature which is found the most agreeable for the air of apartments, in which the occupants are not engaged in bodily exercise, is from 63° to 65° F. The charcoal brazier is a very ancient method of warming an apartment. The Greeks and other nations commonly used it, and they sought to correct the deleterious nature of the fumes by burning costly odorous gums, spices, and woods; but the carbonic acid given off by the combustion of charcoal is very injurious to health. The ordinary open coal-fire is, if not the most economical, at least the most agreeable means of heating apartments, but the waste of heat is very considerable. This waste early led to the introduction of closed stoves, first in earthenware and then in metal. These closed stoves, of which

WARMING AND VENTILATION

there are innumerable varieties in form and construction are particularly favored in America and the European continent. For public buildings, warehouses, conservatories, etc., the most extensively employed system of heating is that of large hot-water pipes. The circulation of water is brought about on the principle of the expansion of water by heat, and its greater lightness in consequence. Whatever be the height of the water above, the water when heated in the lower part of a boiler will rise to the surface, making room for other and colder particles to be heated in their turn; hence if a pipe full of water rise from the top of a boiler to any required height, and then return by gentle bends to the boiler at the lower part, heated water will rise and occupy the upright pipe, and the colder water will descend into the boiler to take its place. Thus a continuous circulation may be maintained through pipes in a building, the heated water rising up, passing on, and returning cooled to the lower part of the boiler, causing a satisfactory temperature to be everywhere felt. The greater the elevation to which the heated water ascends, and the higher the initial temperature of the water, the greater is the motive power for circulation. There are also several systems of heating by passing steam or hot air through pipes. Ventilation is the means of renewing the atmosphere, and of maintaining its purity by expelling foul air and admitting fresh without draughts. Of the products which vitiate the air carbonic acid is the most important. Air which has been utilized by living beings is always charged with carbonic acid, and also with a varying amount of watery vapor, the quantity of which is increased as the air is warmed; and smaller quantities of ammonia, and organic matter especially bacteria, still further assist in rendering the atmosphere not only unfit but dangerous for respiration. Authorities on hygiene somewhat vary as to the amount of air necessary for healthy living rooms, but it is generally admitted that not less than 1000 cubic feet of fresh air per healthy person should be supplied every hour, and from 3000 to 4000 cubic feet to rooms occupied by invalids. Mechanical ventilation is generally effected by means of gratings in the ceilings or cornices in communication with flues leading into the open air, and a variety of arrangements have been invented to prevent down-draughts. Public and other large buildings are commonly ventilated in the roof, though sometimes by gratings in or near the floor, but this latter method is objectionable on account of draught. Automatic ventilation is, of course, irregular, owing to changes in wind and temperature, which increase or reduce, or even revert the motive power. In places where large numbers of people congregate and a uniform renewal of air is required, it is therefore necessary to resort to machinery. Many systems are in operation, varying with the nature of the building to be ventilated. Air flues, shafts, or pipes are usually the medium through which air passes in and out; and this passage is generally regulated by pumps or fans

moved by steam or gas engines. The proper ventilation of mines forms a problem for the mining engineer. See Mining, and Sanitary Science.

WARNER, Charles Dudley, American writer, born at Plainfield, Mass., in 1829, graduated at Hamilton college in 1851; studied law and practiced in Chicago; became connected with the newspaper press; traveled in Europe; and in 1884 became joint-editor of Harper's Magazine. His works include: *My Summer in a Garden*, *Saunterings*, *Backlog Studies*, *My Winter on the Nile*, *In the Levant*, *Washington Irving*, etc. He died in 1900.

WARNER, Susan, American writer, born 1819, died 1885. In 1851 she published under the pseudonym of Elizabeth Wetherell, a novel entitled *The Wide, Wide World*, which soon attained extraordinary popularity on both sides of the Atlantic. *Queechy*, which appeared in 1852, was almost equally popular.

WARP. See Weaving.

WARRANT, an instrument or document authorizing certain acts which without it would be illegal. Common forms of judicial warrants are: the warrant of arrest, usually issued by a justice of the peace for the apprehension of those accused or suspected of crimes; the warrant of commitment, a written authority committing a person to prison; the distress warrant, a warrant issued for raising a sum of money upon the goods of a party specified in the warrant; the search warrant, an authority, generally granted to police-officers, to search private premises.

WARRINGTON, a mun., parl., and county borough of England, in Lancashire, with a small portion in Cheshire. Pop. 64,241.

WARSAW, a city of Russia, capital of Russian Poland, or the Vistula province, as that country is now officially designated. Warsaw is famous for its huge churches, numerous and magnificent palaces and monuments, remnants of former Polish grandeur; for its educational institutions; and for its many and extensive gardens, parks, and suburban drives. It was formerly also exceptionally rich in literature and art treasures; most of these have been confiscated and transferred to St. Petersburg. Leather, boots and shoes, woolen and linen stuffs, plated ware, machinery, chemicals, spirits and beer, are some of the most important industrial products. It is the residence of the governor-general of the province, of the commander of the Warsaw military district, and of the Roman and Greek Catholic archbishops. Pop. 638,209, of which many are Jews and Germans.

WAR-SHIP. See Navy.

WART, a small, dry, hard tumor making its appearance most frequently on the hands, sometimes on the face, and rarely on other parts of the body, and occurring usually on children. Warts may be described as collections of abnormally lengthened papillæ of the skin, closely adherent and ensheathed in a thick covering of hard dry cuticle. In most cases they disappear of themselves, or they may be removed by nitric acid, glacial acetic acid, etc.

WART-HOG, a name common to certain members of the hog family, distinguished from the true swine by their dentition, which in some respects resembles that of the elephants. The head is very large; immense tusks project



Head of wart-hog.

from the mouth outward and upward, and the cheeks are furnished with flesh-like excrescences resembling warts. They feed on the roots of plants, which they dig up with their tusks. The African wart-hog or haruja of Abyssinia, and the vlacke-vark of the Dutch settlers of the Cape are familiar species.

WARWICK (wo'rik), a parliamentary borough of England, on a rocky hill on the right bank of the Avon, the county town of Warwickshire. The principal object of interest is Warwick castle, the most magnificent of the ancient feudal mansions of the English nobility. The town unites with Leamington in sending one member to parliament. Pop. 11,903.—The county has an area of 885 sq. miles, or 566,548 acres. Coal (output over a million tons per annum) and several kinds of building stone are abundant. Warwickshire is also famous for its manufactures, and includes the two great manufacturing towns of Birmingham and Coventry. Pop. 897,678.

WARWICK, Richard Neville, Earl of, "the kingmaker," a great English nobleman, born 1428, killed 1471. He was the son of an earl of Salisbury, and became Earl of Warwick by marrying the heiress of the title and estates. Taking the Yorkist side in the Wars of the Roses, he was the main instrument in placing Edward IV. on the throne in 1461 in place of Henry VI., and became the most powerful nobleman in the kingdom. Quarreling with Edward on account of the latter's marriage, he went over to Henry's side, and was able to place him again on the throne, but was defeated and slain at the battle of Barnet.

WASHBURN, Cadwallader Colden, American soldier and capitalist, was born at Livermore, Maine, in 1818. He made fortunate investments in timber lands and became one of the pioneers in the flour-milling industry. In 1854 he was elected to congress from Wisconsin by the anti-slavery element, and was twice reelected, serving until 1861. He raised the second regiment of Wisconsin cavalry and was mustered into the federal service in February, 1862. In November, 1862, he was promoted to be major-general and was given a division in the Army of the Tennessee. He was again a member of congress from 1867 to 1871, and in 1872-74 was governor of Wisconsin. He gave largely to education, built an observatory at the University of Wisconsin, and founded an orphan asylum at Minneapolis. He died in 1882.

WASHBURN, Elihu Benjamin,

American diplomat, was born at Livermore, Maine, in 1816. He removed in 1841 to Galena, Ill. He was a delegate to the whig national convention of 1844, and from 1853 until 1869 was a member of congress. When Grant became president, he made Washburne his secretary of state, but he resigned to become minister to France. During the Franco-Prussian war he was the only foreign representative who remained at his post. In 1877 he returned to the United States and settled at Chicago. He published *Recollections of a Minister to France*, 1869-77. He died in 1887.

WASHINGTON, the capital of the United States, in the District of Columbia, at the confluence of the Anacostia with the Potomac, here navigable by ships of the largest class; 200 miles southwest of New York. The site was selected in 1790 by Washington himself, and the plan of the city was drawn up on a most magnificent scale. The streets (70-120 feet wide) cross each other at right angles, and are intersected diagonally by avenues (120-180 feet wide), which bear the names of states in the Union. A large portion of these spacious thoroughfares are planted with elms and poplars, well paved, and well kept. Numerous open spaces, large and small, some of them beautifully laid out, are distributed throughout the vast area occupied by the town. First among the numerous public buildings ranks the capitol, the finest structure in the states, on a hill above the Potomac, in the midst of a highly ornamental park of 50 acres. It consists of a central building of freestone, two wings (each with a dome) of white marble, and a lofty central dome of iron, surmounted by a statue of Liberty (total height, 307½ feet). The Rotunda, in the center of the main building, is a magnificent hall, adorned with bas-reliefs and paintings, and a colossal statue of Washington. The entire structure covers 3½ acres, and cost over 12½ million dollars. It accommodates the two houses of congress, the United States supreme court, and until recently also held the extensive congress library (now transferred to a separate building). The edifices provided for the various state departments, such as the treasury, the state, war, and navy departments, the interior department, post-office, etc., are also on a splendid scale. In the midst of these palatial offices stands the more modest yet elegant White House, the residence of the United States president. In addition may be specially mentioned the Episcopal Trinity church, the patent-office, the city-hall, the observatory, the Smithsonian institution, the Columbian college, the arsenal, the navy-yard (42 acres), and the Washington obelisk, built of white marble and blue gneiss, 555½ feet high, with a base 104 feet square. The city is protected by numerous forts and batteries, the harbor defenses especially being of a formidable description. Pop. 1909, 340,000.

WASHINGTON, occupies the north-western corner of the United States, and is bounded on the north by British Columbia, on the east by Idaho, on the south by Oregon, and on the west by the Pacific ocean. It ranks sixteenth in

size among the states. The state is divided by the Cascade mountains into two unequal sections, which have very different climatic and physical characteristics and commercial and business interests. The Columbia river, which forms almost the entire boundary between Washington and Oregon, traverses the state from east to west, and with its tributaries drains almost the whole state. The tide-water basin at the mouth of the Columbia and Chehalis valley, farther north are the most important indentions of the coast south of the Strait of Juan de Fuca. This body of water, together with the extensive inland sea known as Puget sound, affords some of the best harbors in the world, and is of great commercial



Seal of Washington.

importance. The soils are fertile in most parts of the state. On the eastern spurs and slopes of the Cascades there are forests of pine. Western Washington has magnificent forests. They consist of gigantic coniferous trees such as the Douglas spruce, giant cedar, and Western hemlock. Washington is the most important coal-mining state on the Pacific coast. Gold and silver are mined in fluctuating quantities. Considerable quantities of limestone and some sandstone, granite, and marble are quarried. In 1850 fish were shipped from Washington, and since that date the growth in the industry has been rapid. The total amount invested in the industry is over \$7,000,000. Salmon is the largest single product. The canning and packing of fish ranks third among the industries of the state. Alfalfa, clover, and other grasses and vegetables and fruit are the chief crops. Wheat constitutes over half of the total crop area of the state. The soil is exceedingly fertile and a high per acreage yield is obtained. Barley and oats are the only other cereals of importance. Hay and forage rank second in area and value. Potatoes are a favorite crop, and sugar-beet culture has developed in Spokane county. The southeastern counties lead in fruit-raising. The alluvium soil at the mouths of the tributary streams to the Walla Walla are peculiarly adapted to the cultivation of orchard fruits. Extensive areas are too arid for cultivation afford pasturing facilities. All kinds of domestic animals are rapidly increasing in numbers. Manufacturing has developed since 1885, when railroad connection was made with the older

parts of the country. A great impetus was given to the industry through the discoveries of gold in Alaska in 1897. The most important branch of industry is the sawing of lumber. Next in importance is the manufacture of flour and grist mill products. An Oriental market is developing for the products of this industry. Seattle is the largest manufacturing center, followed by Tacoma and Spokane. Washington possesses the best commercial facilities of any of the Pacific states. The principal outlet to the sea is Puget sound, which, by reason of its position and the numerous bays and inlets with which its shores are indented, is especially well adapted to commercial purposes. Water communication with the interior is by the Columbia and Snake rivers and their branches. The Columbia is navigable for large steamers as far as Vancouver. The principal railroad lines are the Northern Pacific and the Great Northern. They both traverse the state from east to west as far as Seattle, where the Northern Pacific turns south, extending to Portland, Oregon, and the Great Northern turns north to the Canadian border. The Canadian Pacific operates trains over the Seattle and International railway, and thus brings the commercial centers of the state into touch with a third continental system. The population is confined mainly to the Puget sound region and the southeastern part of the state. The leading religious denominations in point of numbers are the Roman Catholics, Methodists, Disciples of Christ, Presbyterian, Baptists, and Congregationalists. The principal institutions of learning in the state are the University of Washington at Seattle; Gonzaga college, at Spokane; Whitman college, at Walla Walla; and the Washington Agricultural college and School of Science, at Pullman. The first event in history relating to Washington was the discovery, in 1592, of the Strait of Juan de Fuca by an old Greek pilot of that name in the service of Spain. In 1810 two expeditions were sent out by John Jacob Astor for the purpose of establishing a fur-trading empire on the Columbia and its tributary lands and streams. In 1813 the fortunes of war compelled the transfer of the Astor Fur company to the Northwest Fur company. Henceforward for many years the history of the state is the history of the operations of the great Northwest and Hudson Bay companies. Washington was first organized as a territory in 1853, with an area much greater than that of the present state. It was reduced to its present limits in 1863, and was admitted to the Union in 1889. In national politics the state voted for republican electors in 1892, and for a fusion ticket of democrats and populists in 1896, but returned to the republican column in 1900, 1904 and 1908. Within the last few years the development of the state has been phenomenal. Pop. 1,250,000.

WASHINGTON, University of, a co-educational, state institution at Seattle, Wash., founded in 1861. In 1906 the university had an attendance of 631 in the College of Liberal Arts, College of Engineering, the Schools of Mines,

Pharmacy, and Law, and the Graduate School. In the same year it had a faculty of 37, a library of 20,000 volumes and 15,000 pamphlets. The university grounds cover 355 acres within the city limits.

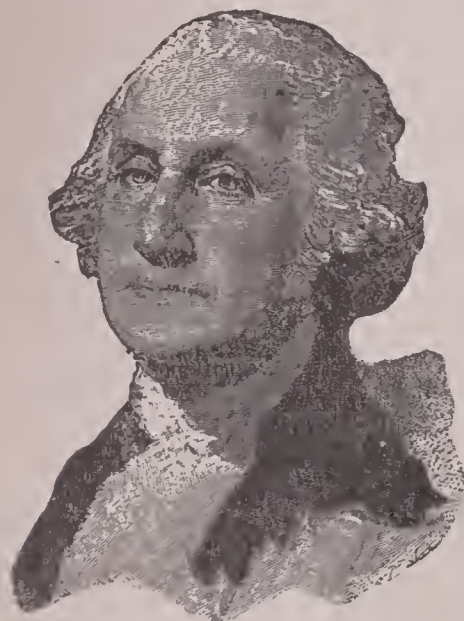
WASHINGTON, the county seat of Daviess co., Ind., 85 miles southwest of Indianapolis, on the Evansville and Terre Haute and the Baltimore and Ohio Southwestern railroads. It is the commercial center of a farming and stock-raising region, especially noted for its deposits of coal, kaolin, and fire clay. Pop. 10,219.

WASHINGTON AGRICULTURAL COLLEGE AND SCHOOL OF SCIENCE, a coeducational state institution at Pullman, Wash., established in 1890 on the national land grant act. It offers partially elective courses in the departments of mathematics and civil engineering, chemistry, botany and zoology, agriculture, horticulture, English, economic science and history, mechanical engineering, modern languages, mining engineering, and military science and tactics, with supplementary courses in physics, geology, and mineralogy, Latin, and education. In addition, special instruction is provided in the schools of agriculture, dairying, pharmacy, veterinary science, and business, the school for artisans, and the preparatory school. Provision is also made for graduate instruction.

WASHINGTON, Booker Taliaferro, an American negro educator, was born near Hale's Ford, Franklin co., Va., in 1858. In 1881 he was appointed to establish a colored normal school at Tuskegee, Ala., the state legislature having granted an annual appropriation of \$2000 to be used for the salaries of instructors. He opened the school with 30 scholars, and himself as the only teacher. Subsequently he transferred the school to its present site on a plantation about one mile from Tuskegee. His efforts to better the condition of this institution led to his appearance at important public assemblages, and his addresses on these occasions soon made him known as a remarkably fluent and effective speaker. His most notable address was that given at the opening of the Atlanta (Ga.) Cotton States and International exposition in 1895. In 1900 he organized the National Negro Business League at Boston, Mass. His publications include: *The Future of the American Negro*, *Up from Slavery*, and *Character-Building*.

WASHINGTON, George, the hero of American independence, and "the father of his country" as he is popularly called, was born in Westmoreland county, Virginia, on the 22d February, 1732; died at Mount Vernon, 14th December, 1799. He was the great-grandson of John Washington, an Englishman, who emigrated in 1657; and the son of Augustine Washington, a substantial farmer, being the eldest of a second family. His education was limited to the elementary subjects, but he acquired a fair knowledge of mathematics and surveying, chiefly by self-study, and when his widowed mother prevailed upon him to abandon the idea of entering the British navy, he adopted sur-

veying as a profession. His military career commenced at the age of nineteen, when he was appointed adjutant-general of Virginia militia; and before long he showed in operations against the French that he united in an eminent degree the qualities belonging to a successful commander, though in 1754, when in command of his regiment, he had to capitulate to a superior French force. In 1755 he accompanied General



George Washington.

Braddock as a volunteer, and was almost the only officer who returned safe from the disastrous expedition. In 1758 he took an important part in the expedition that captured Fort Du Quesne, where Pittsburg now stands. In the meantime extensive estates and plantations at Mount Vernon had come into his possession through the death of his half-brother. To these possessions he added largely by marrying in 1759 Mrs. Martha Custis, a wealthy young widow. He also sat for some years in the Virginia assembly. Shortly after the outbreak of the war of independence Washington was elected commander-in-chief of the American forces, 5th June, 1775, in which capacity his career belongs to the general history of his country. (See United States, History.) It is sufficient to say that the struggle was carried on by him under extraordinary disadvantages, including unfriendliness on the part of officers, and virulent attacks on the part of others. When peace was signed in 1783 Washington retired to Mount Vernon, and refused all recompense for his invaluable services beyond his personal expenses. In 1787 he was a member of and presided over the convention which met to revise the articles of union between the states, the result being the constitution which is still in force, and which was adopted in 1788. Washington was elected the first president of the republic, and inaugurated 30th April, 1789, and he was again elected in 1793. During both terms he performed the onerous duties of his office with marked ability, and the advances in prosperity made by the young republic were extraordinary. At the close of his second term of office he re-

signed (1797), but when a misunderstanding with France threatened further trouble congress appointed him lieutenant-general of the forces (1798). He died from an attack of acute laryngitis. Washington had a mind far above party strife, and was mourned by men of all parties. He had no family. Mount Vernon, on the Potomac about 15 miles from Washington, became national property in 1858. His remains are deposited in a vault in the grounds.

WASHINGTON MONUMENT, a huge obelisk erected in the city of Washington, having a total height of 555 feet 5½ inches. It is the highest masonry structure in the world. The cornerstone was laid in 1848 and work on the monument continued slowly until 1877, when it ceased, but was resumed in 1878, and finished in 1884. The Washington National Monument society originated the plan and controlled the work of construction until 1877, when its property was conveyed to the United States. Maryland marble is the material out of which the monument was constructed. The foundation covers an area of 16,000 feet, and weighs 36,912 gross tons. The shaft is 55 feet 1.5 inches square at the bottom, 34 feet 5.5 inches square at the top, weighs 43,633 gross tons, and is 500 feet 5½ inches high; the apex, weighing 300 tons, is 55 feet high, its summit being nearly 600 feet above the tide-water of the Potomac. The apex is capped by an aluminum point. It has 262 marble pieces, of seven-inch thickness. The original designs were by Robert Mills. An elevator and an iron stairway of 900 steps within the monument afford access to the base of the apex.

WASH'ITA, a river of the United States, in Arkansas and Louisiana, an affluent of the Red river; length, 600 miles; valuable for navigation.

WASP, the common name applied to insects of various genera. Those best known belong to the genus *Vespa*, and live in societies, composed of females, males, and neuters or workers. The females and neuters are armed with an extremely powerful and venomous sting. Their nests, some of them very ingenious both as regards material and construction, are made in holes underground, or attached to the branches of trees, to walls, etc. The cells are of a hexagonal form, arranged in tiers with the mouth downward, or opening sideways, in which the larvæ and pupæ are contained. Wasps are very voracious, eating other insects, sugar, meat, fruit, honey, etc.

WATCH, a well-known pocket instrument for measuring time, invented at Nürnberg in the end of the 15th century. The wheels in watches are urged on by the force of a spiral spring, generally of steel, contained in a cylindrical barrel or box, to which one end of a chain is fixed, the chain also making several turns round the barrel outside; the other end of the chain is fixed to the bottom of a cone with a spiral groove cut on it, known as the fusee. On the bottom of the fusee the first or great wheel is put. The barrel-arbor is so fixed in the frame that it cannot turn when the fusee is winding up. The inner end of the spring hooks on to the barrel-

arbor, the outer to the inside of the barrel. If the fusee is turned round in the proper direction it will take on the chain, and consequently take it off from the barrel. This coils up the spring; and if the fusee and great wheel are left to themselves, the force exerted by the spring in the barrel to unroll itself will make the barrel turn in a contrary direction to that by which it was bent up. This force communicating itself to the wheels will set them in motion. Their time of continuing in motion will depend on the number of turns of the spiral groove on the fusee, the number of teeth in the first or great wheel, and on the number of leaves in the pinion upon which the great wheel acts, etc. The necessity of keeping the watch from "running down," and of making the wheels move with uniform motion, gave rise to the use of the balance-wheel and hair-spring (taking the place of the pendulum of a clock) and the variously and ingeniously designed mechanism, the escapement (which see). On the perfection of the escapement the time-keeping qualities of a watch largely depend. Of the many varieties invented and perfected, watches are now almost exclusively provided with either the horizontal, the lever, or the chronometer or detached escapement. (See Chronometer.) In all but the best class English watches the fusee has been abandoned in favor of the going-barrel. The latter offers better facilities for keyless work, and keyless watches are manufactured in increasing quantities. The going-barrel watch can also be produced at a cheaper rate, and for ordinary purposes is amply reliable. The mainspring in this class of watch is very long, but only a few coils are brought into action. The great wheel is attached to the going-barrel itself, thus the spring force is directly transmitted to the escapement. The invention of the spiral hair-spring by Dr. Hook (about 1658), the scientific application of its properties since, and the intelligent use of compensation (which see) in the balance, have combined to give to the best chronometers of to-day a uniformity of rate which it is probably impossible to excel. A number of watches for special performances are also constructed. Such are the calendar watch, the repeater, the chronograph (which see), etc. Large quantities of the cheaper class of watches are now made by machinery in Switzerland, France, Germany, England, and the United States. They are generally produced on the interchangeable system, that is, if any part of a watch has become unfit for service, it can be cheaply replaced by an exact duplicate; the labor of the watch-repairer thus becoming easy and expeditious.

WATCH, a certain part of the officers and crew of a vessel who together work her for an allotted time, the time being also called a watch. The time called a watch is four hours, the reckoning beginning at noon or midnight. Between 4 and 8 p.m. the time is divided into two short or dog-watches, in order to prevent the constant recurrence of the same portion of the crew keeping the watch during the same hours.

WATER, a universally-diffused liquid.

WATER-BED

It was classed among the elements until the close of the 18th century, when Lavoisier, profiting by the experiments of Cavendish, proved it to be a compound of hydrogen and oxygen, in the proportion of two volumes of the former gas to one volume of the latter; or by weight 2 parts of hydrogen to 16 parts of oxygen; Pure water is a colorless, tasteless, inodorous liquid; a powerful refractor of light; a bad conductor of heat and electricity; it is very slightly compressible, its absolute diminution for a pressure of one atmosphere being only about 51.3 millionths of its bulk. Although water is colorless in small quantities, it is blue like the atmosphere when viewed in mass. It takes a solid form, that of ice or snow, at 32° F. (0° C.), and all lower temperatures; and it takes the form of vapor or steam at 212° F. (100° C.) under a pressure of 29.9 ins. of mercury, and retains that form at all higher temperatures. Under ordinary conditions water possesses the liquid form only at temperatures lying between 32° and 212°. It is, however, possible to cool water very considerably below 32° F. and yet maintain it in the liquid form. Water may also be heated, under pressure, many degrees above 212° F. without passing into the state of steam. The specific gravity of water is 1 at 39° 2 F., being the unit to which the specific gravities of all solids and liquids are referred, as a convenient standard, on account of the facility with which it is obtained in a pure state; one cubic inch of water at 62° F. and 29.9 inches barometrical pressure, weighs 252.458 grains. Distilled water is 815 times heavier than atmospheric air. Water is at its greatest density at 39° 2 F. (= 4° C.), and in this respect it presents a singular exception to the general law of expansion by heat. If water at 39° 2 F. be cooled, it expands as it cools till reduced to 32°, when it solidifies; and if water at 39° 2 F. be heated, it expands as the temperature increases in accordance with the general law. In a chemical point of view water exhibits in itself neither acid nor basic properties; but it combines with both acids and bases forming hydrates; it also combines with neutral salts. Water also enters, as a liquid, into a peculiar kind of combination with the greater number of all known substances. Of all liquids water is the most powerful and general solvent, and on this important property its use depends. Without water not only the operations of the chemist but the processes of animal and vegetable life would come to a stand. In consequence of the great solvent power of water it is never found pure in nature. Even in rain-water, which is the purest, there are always traces of carbonic acid, ammonia, and sea-salt. Where the rain-water has filtered through rocks and soils, and reappears as spring or river water, it is always more or less charged with salts derived from the earth, such as sea-salt, gypsum, and chalk. When the proportion of these is small the water is called soft, when larger it is called hard water. The former dissolves soap better, and is therefore preferred for washing; the latter is often pleasanter to drink. Some springs contain a con-

siderable quantity of foreign ingredients, which impart to the water particular properties. They are known under the general term mineral waters, and according to the predominating constituent held in solution are divided into carbonated waters (alkaline, magnesian, calcareous, and chalybeate), sulphatic waters (containing chiefly sulphates), chlorinated waters (containing chiefly chlorides), and sulphuretted waters (containing large quantities of sulphides or of sulphuretted hydrogen). The only way to obtain perfectly pure water is to distil it, but matter simply held in suspension may be got rid of by suitable filtration. The great reservoirs of water on the globe are the oceans, seas, and lakes, which cover more than three-fifths of its surface, and from which it is raised by evaporation, and, uniting with the air in the state of vapor, is wafted over the earth ready to be precipitated in the form of rain, snow, or hail. Water, like air, is absolutely necessary to life, and healthy human life requires that it should be free from contamination, hence an ample and pure water-supply is considered as one of the first laws of sanitation.

WATER-BED, a bed consisting of an india-rubber mattress filled with water, and generally used by persons confined to bed. Its pliability prevents pressure on the body of the patient, and thus avoids bed-sores. Water-beds have been largely superseded by the more convenient and healthier air-beds.

WATER-BEETLE, the name given to various species of beetles, having legs adapted for swimming, the two hinder pairs being flattened and fringed with hair.

WATERBURY, a city in New Haven co., Connecticut, in a valley on the Naugatuck river, 77 miles northeast of New York. It is an important railway junction and manufacturing town. Brass and brass goods are the staple products. Waterbury machine-made watches and clocks are known throughout the world. Electro-plate is also made. Pop. 49,859.

WATER-COLORS, in painting, colors carefully ground up with water and isinglass or other mucilage instead of oil. Water-colors are often prepared in the form of small cakes dried hard, which can be rubbed on a moistened palette when wanted. Moist water-colors in a semi-fluid state are also used; they are generally kept in metal tubes, which preserve them from drying up.

WATER-CRESS, a cruciferous plant distributed throughout Europe, Western Asia, North Africa, and choking some rivers of New Zealand, where the stem grows as thick as the wrist. It grows on the margin of clear streams, or even partly immersed in the water. It has antiscorbutic properties, and is cultivated near many large towns to be used as salad, or otherwise.

WATERFORD, a city, parliamentary borough, and seaport in the southeast of Ireland, capital of the county of same name, 97 miles s.s.w. of Dublin, on the right bank of the Suir, which soon after joins the Barrow, the combined stream reaching the sea by the fine estuary known as Waterford harbor. Pop. 26,743.—The county belongs to the

WATER LILY

province of Munster. The area is 461,552 acres, or 721 sq. miles, of which about a sixth is under tillage. Pop. 87,030.



WATER-GAS, a gas prepared by passing steam through incandescent carbon. It is used for heating and welding purposes in metallurgy, and also for illumination, especially in the United States. Numerous deaths from poisoning have resulted from its use, however, this being largely due to its want of smell. Burnt in the usual way it gives a blue flame, but by suspending a comb of thin magnesium rods in the flame the filaments are quickly heated to a white heat, producing a bright glow light of high illuminating power, but which is said to be neither unpleasant to the eye nor prejudicial to the sight.

WATER-GLASS, a substance which, when solid, resembles glass, but is slowly soluble in boiling water, although it remains unaffected by ordinary atmospheric changes. It consists of the soluble silicates of potash or soda, or a mixture of both. It is prepared either by breaking down and calcining flint nodules, the fragments or particles of which are then added to a solution of caustic potash or soda, whereupon the whole is exposed for a time to intense heat, or by fusing the constituents together in a solid state, and afterward reducing them to a viscid condition. Among the purposes to which water-glass is applied are painting on glass, coating stone, wood, and other materials to render them waterproof, glazing scenery and paintings, fixing wall-paintings, etc.

WATER LILY, a small group of herbaceous and aquatic plants, natives of all temperate and warm climates. The sepals are three to five, petals three to many, stamens six to many, and ovaries three to many, free, or united into a compound pistil. The stems are creeping and submerged and the leaves mostly peltate, long-petioled, and floating. Fourteen species are North American. The white water lily is common in the Eastern United States. The lotus, water chinquapin, or yellow nelumbo occurs in the waters of the Mississippi valley. It is curious on account of its large top-shaped receptacle, in the cavities of whose upper surface the pistils are imbedded. The common yellow water lily, or spatter-dock has smaller, yellow flowers with fewer petals. It is

widely distributed in the United States. The Victoria lily, the largest of all, occurs in the waters of the Amazon region



White water-lily, one-half natural size.

of South America. Its peltate leaves are 6 to 10 feet in diameter with an upturned margin 2 inches in height. Its flowers



Lotus lily, one-fifth natural size.

are from 10 to 15 inches in diameter, pinkish and fragrant. The starchy seeds are eaten by the natives. It is now



Victoria water-lily, 1/16th natural size.

grown in the parks and public gardens of many cities of the United States, and flowers in the open air as far north as Washington.

WATERLOO, the capital of Black Hawk co., Ia.; on the Cedar river, and the Burl., Ced. Rap. and N., the Chi. Gt. W., and the Ill. Cent. railways; 93

miles w. of Dubuque, 297 miles w. of Chicago. It is in an agricultural region, and contains flour-mills, foundries, carriage-factories, agricultural-implement works, and sash, door, and blind factories. Pop. 14,906.

WATERMELON, an annual vine, native of tropical Africa, and extensively cultivated in warm climates, particularly in Southern Russia and in the United States. The refreshing red, greenish, or yellow pulp of its ripe fruit contains about 93 per cent water and 2 per cent sugar. A very large number of varieties, especially red-fleshed ones, are in cultivation. The white-fleshed rather solid form used largely in preserving is generally known as a "citron" or "preserving melon." The watermelon is sensitive to frost and is easily stunted in growth by cold. It thrives best in a rich, warm, sandy loam well supplied with humus.

WATER-PITCHER, the popular name of plants, the leaves of which somewhat resemble pitchers or trumpets in general form.

WATERPROOF CLOTH, cloth rendered impervious to water. There are numerous processes for waterproof fabrics of all kinds. The earliest patent, that of Macintosh (1823), consisted in covering cloth with a paste obtained by dissolving caoutchouc in benzol or coal naphtha. In the treatment of cotton and linen cloth a small proportion of sulphur is generally added. A thin layer of this rubber solution is spread on the fabric by special machinery, after which the cloth is doubled, pressed, and finished in calenders, the waterproof layer being thus in the center of the finished material. Textiles thus manipulated become also impervious to air, and from a hygienic point of view unsuitable for prolonged personal wear. This led to the introduction of other solutions and methods of application intended to produce fabrics, which, while resisting rain, do not altogether obstruct ventilation. Consecutive dipping of cloths in soap and alum solutions, or in gelatine and gall solutions, or in a solution of acetate of lead and then in a solution of alumina, has been resorted to with more or less success. The new substance called algin, obtained from sea-weed, has been strongly recommended for the same purpose. Another recent patent process consists in treating the fibers in the solution instead of the manufactured textile, and the fabric thus produced, while rain-resisting, offers the same ventilation as ordinary materials.

WATER-RAT. See Vole.

WATER-SPOUT, a remarkable meteorological phenomenon frequently observed at sea, and exactly analogous to the whirlwinds experienced on land. It occurs when opposite winds of different temperatures meet in the upper atmosphere, whereby a great amount of vapor is condensed into a thick black cloud, to which a vortical motion is given. This vortical motion causes it to take the form of a vast funnel, which, descending near the surface of the sea, draws up the water in its vortex, which joins in its whirling motion. The whole column, which after the junction extends from the sea to the clouds, assumes a

magnificent appearance, being of a light color near its axis, but dark along the sides. When acted on by the wind the column assumes a position oblique to the horizon, but in calm weather it maintains its vertical position, while at the



Water-spout.

same time it is carried along the surface of the sea. Sometimes the upper and lower parts move with different velocities, causing the parts to separate from each other, often with a loud report. The whole of the vapor is at length absorbed in the air, or it descends to the sea in a heavy shower of rain. Sudden gusts of wind, from all points of the compass, are very common in the vicinity of water-spouts. What are sometimes called water-spouts on land, or cloud-bursts, are merely heavy falls of rain of a very local character that occur generally during thunder-storms.

WATERTOWN, the capital of Jefferson co., New York, on Black river, about 10 miles above its entrance into Lake Ontario. The river is crossed by several bridges, and its rapids afford abundant water-power. Pop. 25,696.

WATERTOWN, a city in Jefferson co., Wisconsin, on the Rock river and on the Chicago, Milwaukee & St. Paul and Chicago & Northwestern Railroads. It is a busy manufacturing and commercial town. Pop. 10,100.

WATER-VOLE. See Vole.

WATER-WHEEL, a wheel moved by water, as the overshot wheel, the undershot wheel, the breast-wheel, and the turbine. See these terms.

WATSON, John Crittenden, American naval officer, was born in Frankfort, Ky., in 1842. He became a master in the navy in 1861, and served throughout the civil war. In 1887 he became a captain and a commodore ten years later, and in the Spanish-American war commanded the blockading squadron on the North Cuban coast from May to June, 1898, when he was made commander-in-chief of the Eastern squadron. He was commandant of the Mare Island navy yard from October, 1898, to May, 1899, was promoted to the rank of rear-admiral in March, 1899, was commander-in-chief of the naval forces on the Asiatic station from June, 1899, to April, 1900, and in October, 1900, became president of the naval examining board and in 1902, president of the naval examining and retiring boards.

WATT, James, the celebrated improver of the steam-engine, was born at Greenock, January 19, 1736; and died at his seat of Heathfield, Staffordshire, August 25, 1819. In 1774 he acted as a civil engineer—made several surveys for canals and harbors, and some of his plans were afterward carried into

execution. It was during this period that he conceived and gave shape to his improvements on the steam-engine, which have rendered his name famous.



James Watt.

To give his inventions practical form he associated himself in 1774 with Mathew Boulton, the firm of Boulton and Watt having their works at Soho, Birmingham. He retired from business in 1800.

WATTEAU (vát-ō), Jean Antoine, a French painter, born at Valenciennes, 1684; died at Nogent-sur-Marne, 1721. For many years he struggled in obscurity, but his talent once recognized, he rapidly became popular and prosperous. In 1717 he was received at the academy, and enrolled as a painter of pleasure parties, balls, masquerades, etc., subjects in which he excelled. Lightness, elegance, and brilliancy form the chief attractions of his style.

WATTERSON, Henry, American journalist, was born in Washington, D. C., in 1840. He entered journalism in Washington as editorial writer for the States, served in the confederate army in 1861-62, and in 1862-63 edited in Chattanooga the Rebel, the official newspaper of the state of Tennessee. In 1867 he became editor-in-chief of the Louisville Journal and later he established the Courier-Journal, of which he became the editor. In 1876-77 he represented the Louisville district in congress. Delegate-at-large from Kentucky to six democratic national conventions, presiding over that of 1876 and chairman of platform committee in the others. In 1896 he declared himself a gold democrat. Among his works are History of the Spanish-American War, Abraham Lincoln, etc.

WATERVILLE, a city in Kennebec county, Me.; on the Kennebec river, and the Maine Cent. railroad; 18 miles n. by e. of Augusta, 80 miles n.e. of Portland Pop. 11,115.

WATERTOWN (wa'tēr-toun), a town including several villages, in Middlesex co., Mass., seven miles west of Boston, on the Charles river, and on the Boston and Maine railroad. Pop. 11,500.

WATTLE-BIRD, an Australian bird belonging to the honey-eaters, and so named from the large reddish wattles on its neck. It is about the size of a magpie, and is of bold, active habits.

WATTS, George Frederick, R.A., English artist, born 1817. He first exhibited at the Royal academy in 1837. Among

his more important pictures are: Life's Illusion (1849), The Window Seat and Sir Galahad (1862), Ariadne (1863), Esau (1865), Love and Death (1877), Time, Death, and Judgment (1878), Happy Warrior (1884), Hope (1886), Judgment of Paris (1887), The Angel of Death (1888), and Fata Morgana (1889). He is one of the most subtle and powerful of portrait-painters, among his successful work in this line being Tennyson, Millais, Sir F. Leighton, Cardinal Manning, Browning, etc. He is perhaps the greatest idealist in contemporary British art. He became R.A. in 1868, and retired in 1896. He has presented some of his pictures to the nation. He died in 1903.



Wattle-bird.

WAUKEGAN (wa-kē'gan), the county seat of Lake co., Ill., 35 miles north of Chicago, on Lake Michigan, and on the Chicago and Northwestern railroad. Pop. 11,226.

WAUKESHA (wa'kē-shā), the county seat of Waukesha co., Wis. 17 miles west of Milwaukee, on the Little Fox river, and on the Chicago, Milwaukee and St. Paul, the Chicago and Northwestern, and the Wisconsin Central railroads. Pop. 10,100.

WAUSAU (wa'sa), the county seat of Marathon co. Wis., 200 miles northwest of Milwaukee, on the Wisconsin river, and on the Chicago, Milwaukee and St. Paul and the Chicago and Northwestern railroads. Pop. 14,324.

WAVES, in physics, disturbances of matter in such a way that energy is transmitted through great distances, sometimes, but not always, accompanied with a slight permanent displacement of the particles of the conveying medium. When a disturbance is produced at a point in air, waves proceed from that point as concentric spheres and carry sound to the ear of a listener. Light is supposed to be propagated by the wave motion of the ether in a manner somewhat analogous to the propagation of sound in air. When waves are produced by the disturbance of a small quantity of liquid, as when a pebble is thrown into a pool, they appear to advance from the disturbed point in widening concentric circles, the height of the wave decreasing gradually as it recedes from the center; but there is no progressive motion of the liquid itself, as is shown by any body floating on its sur-

face. The whole seems to roll onward, but, in reality, each particle of water only oscillates with a vertical ascent and descent. Where the depth of the liquid is invariable over its extent, or sufficient to allow the oscillations to proceed unimpeded, no progressive motion takes place, each ridge or column being kept in its place by the pressure of the adjacent columns. Should, however, free oscillation be prevented, as by the shelving of the shore, the columns in the deep water are not balanced by those in the shallower parts, and they thus acquire a progressive motion toward the latter, or take the form of breakers, hence the waves always roll in a direction toward the shore, no matter from what point the wind may blow. The height of the wave depends in a great measure on the depth of the water in which it is produced. The waves of the ocean have been known to reach a height of 43 feet, from trough to crest. The horizontal pressure of a strong Atlantic wave has been recorded as high as 3 tons to the square foot. Undulatory movements also take place in solids; such are earthquake waves.

WAX, an unctuous-feeling substance partaking of the nature of fixed oil. It is secreted by bees, and is also an abundant vegetable production, entering into the composition of the pollen of flowers, covering the envelope of the plum and of other fruits, and, in many instances, forming a kind of varnish to the surface of leaves. Common wax is always more or less colored, and has a distinct, peculiar odor, of both of which qualities it may be deprived by exposure in thin slices to air, light, and moisture, or more speedily by the action of chlorine. At ordinary temperature wax is solid and somewhat brittle; but it may be easily cut with a knife. Its specific gravity is 0.96. At 155° Fahr. it melts, and it softens at 86°, becoming so plastic that it may be molded by the hand into any form. Wax is insoluble in water, and is only dissolved in small quantities by alcohol or ether. The principal applications of wax are to make candles and medicinal cerates; to give a polish to furniture or floors; to form a lute or cement, for which it is used by chemists; and to serve as a vehicle for colors. Sealing wax is not properly a wax. See Candleberry, China Wax, Wax-palm.

WAX-PALM, a species of palm yielding a substance consisting of two-thirds resin and one-third wax, which is found on its trunk in the form of a varnish. It is a native of the Andes, towering in majestic beauty on mountains which rise many thousand feet above the level of the sea, and sometimes attaining the height of 160 feet.

WAX-WING, an insessorial bird belonging to the dentirostral section of the order. It derives its name from the appendages attached to the secondary and tertiary quill-feathers of the wings, which have the appearance of red sealing-wax.

WAYNE, Anthony, soldier, born in Pennsylvania in 1745; died in Erie, Penn., in 1796. After the battle of Three Rivers, where he was wounded, he was placed in charge of Fort Ticon-

deroga, and on February 21st was commissioned brigadier-general. He fought at the battles of Brandywine, Germantown, and Monmouth, captured the fort of Stony Point on the Hudson river, and successfully attacked Fort Lee, near New York City. Later Wayne was active in the investment and capture of Yorktown. The brevet of major-general was conferred on him October 10, 1783. At the close of the war he went to Georgia, and was elected to congress, serving from October 24, 1791, to March 21, 1792. In April of the last named year he was promoted general-in-chief of the United States army. In August, 1794, with 1,000 men, he marched against the Ohio Indians and signally defeated them, and while descending Lake Erie on his way from Detroit he died from an attack of the gout.

WEASEL, a digitigrade carnivorous animal, a native of almost all the temperate and cold parts of the northern hemisphere. It measures about $2\frac{1}{2}$ inches in height, about $7\frac{1}{2}$ in length, with a tail about $2\frac{1}{2}$ inches long. The body is extremely slender, the head small and flattened, the neck long, the legs short. It feeds on mice, rats, moles, and small birds, and is often useful as a destroyer of vermin in ricks, barns, and granaries. The polecat, ferret, ermine, and sable are akin.

WEATHER. See Meteorology.

WEAVER-BIRD, a name given to birds of various genera, belonging to the Fringillidae or finches. They are so called from the remarkable structure of their nests, which are woven in a very wonderful manner of various vegetable substances. Some species build their nests separate and singly, and hang

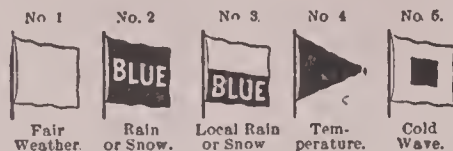


Yellow-crowned weaver and nest.

them from slender branches of trees and shrubs; but others build in companies, numerous nests suspended from the branches of a tree being under one roof, though each one forms a separate compartment and has a separate entrance. They are natives of the warmer parts of Asia, of Africa, and of Australia.

WEATHER AND STORM SIGNALS, flags, scaphores, lanterns, steam whistles, and other devices exhibited or sounded to inform mariners and others of storms or weather conditions. The

system of observations began in 1870 and storm signals were first displayed in the autumn of 1871. The flags adopted for this purpose are five in number, and of the forms and colors indicated below:



When number 4 is placed above number 1, 2, or 3, it indicates warmer; when below, colder; when not displayed, the temperature is expected to remain about stationary. During the late spring and early fall the cold-wave flag is also used to indicate anticipated frosts.



Whistle signals.—A warning blast of from fifteen to twenty seconds duration is sounded to attract attention. After this warning the longer blasts (of from four to six seconds duration) refer to weather, and shorter blasts (of from one to three seconds duration) refer to temperature; those for weather are sounded first.

Blasts.	Indicate
One long.....	Fair weather.
Two long.....	Rain or snow.
Three long.....	Local rain or snow.
One short.....	Lower temperature.
Two short.....	Higher temperature.
Three short.....	Cold wave.

By repeating each combination a few times, with intervals of ten seconds, liability to error in reading the signals may be avoided.

Storm Warnings.—A red flag with a black center indicates that a storm of marked violence is expected. The pennants displayed with the flags indicate the direction of the wind; red, easterly (from northeast to south); white, westerly (from southwest to north). The pennant above the flag indicates that the wind is expected to blow from the northerly quadrants; below, from the southerly quadrants. By night a red light indicates easterly winds, and a white light above a red light westerly winds.

Hurricane Warnings.—Two red flags with black centers, displayed one above the other, indicate the expected approach of a tropical hurricane, and also one of those extremely severe and dangerous storms which occasionally move across the lakes and Northern Atlantic coast.

WEATHER BUREAU, a governmental organization for the purpose of maintaining regular meteorological observations, compiling statistics of the climate, predicting weather and storms, river floods, frosts, rain, and such other atmospheric phenomena as affect the welfare of mankind. The United States weather bureau was reorganized under the department of agriculture, July 1, 1891. The bureau receives daily two

regular sets of weather telegrams at 8 a.m. and 8 p.m. on which are based the morning and evening weather charts and the forecasts for the next thirty-six hours. These forecasts are immediately telegraphed throughout the country and to vessels about to sail. The forecasts of heavy storms, cold waves, and injurious frosts and specially hot weather are verified almost without exception; the forecasts of rain are the least successful of any. Forecasts are communicated to vessels passing by, off the coast by wireless telegraphy. The condition of rivers, especially in times of flood, is telegraphed to all those interested. In the special interest of the crops and agriculture, a weather crop bulletin was published in 1887. During the summer season it gives full details of the temperature, and rainfall as compared with normal conditions, and shows the influence of the weather on the development of the future crop. In the winter season a monthly bulletin shows the quantity of snowfall, the ice in the rivers, the opening and closing of navigation, the condition of winter wheat, and the injury done to crops by cold waves, frosts, or floods. In the interests of the lake navigation, a monthly lake chart is published, showing every feature in regard to the weather or the condition of the lakes than can interest navigators.

WEAVER, James Baird, American politician, was born at Dayton, Ohio, in 1833. He removed to Iowa in 1856. During the civil war he enlisted in the Second Iowa Volunteers, eventually became colonel of the regiment, and in 1865 was brevetted brigadier-general of volunteers. He was active in the organization of the national Greenback party, was elected to represent that party in congress in 1878, and in 1880 was its candidate for the presidency, receiving a popular vote of 308,578. In 1892 he was the candidate of the people's party for the presidency, receiving 22 electoral votes, and a popular vote of 1,041,028. He published *A Call to Action*.

WEAVING, the art of interlacing yarn threads or other filaments by means of a loom, so as to form a web of cloth or other woven fabric. In this process two sets of threads are employed which traverse the web at right angles to each other. The first set extends from end to end of the web in parallel lines, and is commonly called the warp; while the other set of threads crosses and interlaces with the warp from side to side of the web, and is generally called the weft or woof. In all forms of weaving the warp threads are first set up in the loom, and then the weft threads are worked into the warp, to and fro, by means of a shuttle. It was by this fundamental process of interlacing two sets of thread in looms of simple mechanism that the mummy cloths of Egypt, the fine damasks and tapestries of the Greeks and Romans, the Indian muslins, the shawls of Cashmere, and the famed textile fabrics of Italy and the Netherlands were produced. Until comparatively modern times all weaving was effected by means of the hand-loom. This loom, in its latest form, consists

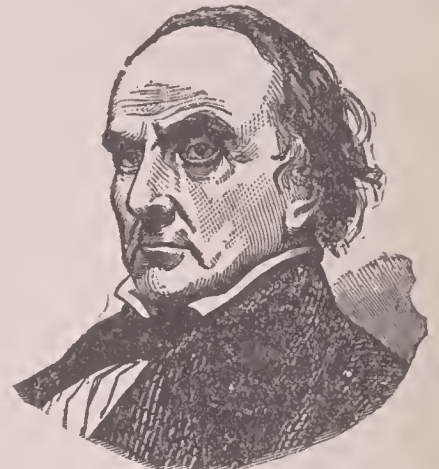
of a frame of four upright posts braced together by cross-beams, the center beam at the back being the warp beam, the beam in front being that upon which the web is wound, while just below this, in front, is the breast-beam for the support of the weaver at his work. At the top of the loom is an apparatus by which the heddles are lifted or lowered by means of treadles under the foot of the weaver. These heddles consist of two frames, from which depend cords attached by a loop or eye to each thread in the warp. As these threads are attached to the frames, alternately, it follows that when one heddle is raised every second thread in the warp is also raised, while the remaining threads are depressed; and this is called shedding the warp. When the warp threads are thus parted there is left a small opening or shed between the threads, and it is through this opening that the weaver drives his shuttle from side to side. The shuttle, which is hollow in the middle, contains the weft-thread wound round a bobbin or pirn, and as the shuttle is shot across the web this weft-thread unwinds itself. When the thread is thus introduced it is necessary to bring it to its place in the fabric. This is accomplished by means of the lay or batten, which is suspended from the top of the loom, and works to and fro like a pendulum by an attachment of vertical rods at each side called the swords. Attached to the lay is what is called the reed, which is a sort of comb having a tooth raised between every two threads of the warp, and so by driving up the lay after a weft-thread has been introduced the weaver strikes home that thread to its place in the cloth. A great improvement was made upon the hand-loom when John Kay about 1740 invented the fly-shuttle, as it was called. This enabled the weaver to drive the shuttle both ways with the right hand by means of a cord attached to a box or trough placed at each end of the shuttle-race, which impelled the shuttle to and fro at each jerk of the cord. But the most important improvement was made on the hand-loom by Joseph Jacquard of Lyons, who, in 1801, invented an apparatus by which the most intricate patterns could be woven as readily as plain cloth. This is accomplished by an ingenious arrangement of hooks and wires, by means of which the warp-threads are lifted in any order and to any extent necessary to make the shedding required by the pattern. The order in which these hooks and wires are successively lifted and lowered is determined by means of a series of paste-board cards punctured with holes, the holes corresponding to a certain pattern and the cards passing successively over a cylinder or drum. The hooked wires pass through these holes and lift the warp-threads in an order which secures that the arranged pattern is woven into the fabric. When the pattern is extensive the machine may be provided with as many as 1000 hooks and wires. Another development was made in the art of weaving by the invention of the power-loom by the Rev. E. Cartwright in 1784. In the power-loom, which has been gradually improved and adapted

to steam-power, the principal motions of the old method of weaving, such as shedding the warp threads, throwing the shuttle, and beating up the thread are still retained. The frame of the power-loom is of cast-iron, and motion is communicated to the loom by means of a shaft, the stroke of the lay being made by cranks attached to the driving shaft, while the shuttle is thrown by means of a lever attachment at the center of the loom. Although the principle of the loom is the same in all kinds of weaving, yet there are numberless modifications for the production of special fabrics. The lappet loom is one suitable for weaving either plain or gauze cloths, and also for putting in representations of flowers, birds, or the like. Cross weaving is a term applied to that process in which, as in gauze weaving, the warp-threads, instead of lying constantly parallel, cross over or twist around one another, thus forming a plexus or interlacing independent of that produced by the weft. Double weaving consists in weaving two webs simultaneously one above the other, and interweaving the two at intervals so as to form a double cloth. Kidderminster or Scotch carpeting is the chief example of this process. Pile weaving is the process by which fabrics like that of velvets, velveteens, corduroy, and Turkey carpets are produced. In the weaving of these fabrics, besides the ordinary warp and weft, there is what is called the pile-warp, the threads of which are left standing in loops above the general surface till cut, and the cutting of which constitutes the pile.

WEBB CITY, a city in Jasper co., Mo.; on the Kan. City, Ft. Scott and Mem., the Mo. Pac. and the St. L. and San Fran. railways; 9 miles s. by w. of Carthage, the county seat. It is a lead and zinc mining center, and is surrounded by an agricultural and fruit-growing region. Pop. 10,872.

WEBER (vā'bër), Karl Maria Friedrich Ernst, Baron von, German musical composer, was born at Eutin in Holstein in 1786. In 1800 he wrote the opera of the *Waldmädchen* (Wood-maiden), and had it performed at Chemnitz and Freiberg in Saxony. In 1803 he visited Vienna, where he became acquainted with Haydn and the Abbé Vogler, from whom he received great help in his studies. The latter procured him a musical directorship in Breslau, on which he entered in 1804. Two years later he exchanged this post for a similar one at Carlsruhe, and he was subsequently (1813-16) director of the opera at Prague. At the close of 1816 he settled at Dresden, where he was founder and director of the German opera. In 1820 he went to Berlin to bring out *Der Freischütz*, the most celebrated of his compositions. It was performed in London and Paris two years later. In 1822 *Euryanthe* was produced on commission for Vienna, and was brought out there in August, 1823. In 1826 Weber visited London to superintend the production of *Oberon*, which he had composed for Covent Garden theater. It was enthusiastically received. The composer, however, was seriously out of health, and died in London, June 5, 1826.

WEBSTER, Daniel, a celebrated American statesman, born in 1782, at Salisbury in New Hampshire, studied for four years at Dartmouth college, and having adopted the legal profession, was admitted as a practitioner in the court of common pleas for Suffolk county. In 1813 he was returned to congress by the federal party in New Hampshire, and from that period to the close of his life took a prominent part in public affairs, being especially distinguished as an orator. No public speaker could surpass him in producing an impression on an audience. He became a



Daniel Webster

senator in 1828, and in 1836 (and again in 1848) was an unsuccessful candidate for the presidency. In 1841, under the presidency of General Harrison, he was appointed secretary of state, and he had an important part in the arrangement of the Ashburton Treaty of 1842. He was opposed to the admission of Texas as a slave state and to the Mexican war, but supported Clay's "compromise" of 1850. In 1850 he succeeded General Taylor as secretary of state for foreign affairs under President Fillmore. This office he continued to occupy till his death, which took place at his estate of Marshfield, Massachusetts in 1852. A collection of his speeches, state papers, and correspondence was published at Boston the year before his death.

WEBSTER, Noah, LL.D., lexicographer, born at West Hartford, Connecticut, in 1758, and educated at Yale college. He chose the law as a profession, but relinquished it for teaching (1782). About the same time he began the compilation of books of school instruction, and published his *Grammatical Institute of the English Language*, in three parts, Part 1 (*Webster's Spelling Book*) containing *A New and Accurate Standard of Pronunciation*; Part 2, *A Plain and Comprehensive Grammar*; Part 3, *An American Selection of Lessons in Reading and Speaking*. All these works had an enormous sale. His literary activity was henceforth very great, the works issued by him during the next few years including important legal and linguistic studies. In 1789 he settled at Hartford to practice law, but removed in 1793 to New York, where for some time he devoted himself to journalism.

WEDDING ANNIVERSARIES

In 1806 he published an 8vo English dictionary, which led the way for his great work, the American Dictionary of the English Language. In preparing this work he visited England, and he



Noah Webster

finished the dictionary during an eight months' residence in Cambridge. In June, 1825, he returned to America. The first edition of his dictionary was published in 1828 (2 vols. 4to); it was followed by a second in 1841; since which time several enlarged and improved editions have appeared. He died in 1843.

WEDDING ANNIVERSARIES, the names given to the several anniversaries of a marriage are said to be of quite ancient origin, and arose from the gift which was regarded as the most suitable offering from the husband to the wife. The names commonly given to such anniversaries are for the first, paper; second, straw; third, candy; fourth, leather; fifth, wooden; seventh, floral; tenth, tin; twelfth, linen; fifteenth, crystal; twentieth, china; twenty-fifth, silver; thirtieth, pearl; thirty-fifth, coral; fortieth, emerald; forty-fifth, ruby; fiftieth, gold; seventy-fifth, diamond. The diamond wedding, however, is often celebrated at sixty years of married life. The others that are most frequently celebrated are the paper, wooden, tin, crystal, silver, and golden.

WEDGE, a piece of wood or metal, thick at one end, and sloping to a thin edge at the other, used in splitting wood, rocks, etc. In geometrical terms it is a body contained under two triangular and three rectangular surfaces. It is one of the mechanical powers, and besides being used for splitting purposes, is employed for producing great pressure, and for raising immense weights. All that is known with certainty respecting the theory of the wedge is that its mechanical power is increased by diminishing the angle of penetration. All cutting and penetrating instruments may be considered as wedges.

WEDGWOOD, Josiah, a celebrated potter, born at Burslem, in Staffordshire, in 1730. He turned his attention to white stoneware, and to the cream colored ware for which he became famous; and he succeeded in producing a ware so hard and durable as to render

works of art produced in it almost indestructible. His reproduction of the Portland Vase is famous. He also executed paintings on pottery without the artificial gloss so detrimental to the effect of superior work. His improvements in pottery created the great trade of the Staffordshire Potteries. He died in 1795.

WEDGWOOD-WARE, a superior kind of semi-vitrified pottery, without much superficial glaze, and capable of taking on the most brilliant and delicate colors produced by fused metallic oxides and others; so named after the inventor. It is much used for ornamental ware, as vases, etc., and, owing to its hardness and property of resisting the action of all corrosive substances, for mortars in the laboratory.

WEDNESDAY, the name of the fourth day of the week (in Latin, dies Mercurii, day of Mercury), derived from the old Scandinavian deity Odin or Woden.

WEED, Thurlow, American journalist and political leader, was born at Cairo, Greene co., N. Y., in 1797. He became editor of the Rochester daily Telegraph in 1822, of which three years later he also became the proprietor. He was for several years a member of the state legislature. In 1830 Weed removed to Albany and established the Albany Evening Journal. For a brief period after the war he served on the editorial staff of the New York Times, and from 1867-78 was editor of the Commercial Advertiser. In 1866 he published Letters from Europe and the West Indies. He died in New York City, November 22, 1882.

WEEK, a period of seven days, one of the common divisions of time, the origin of which is doubtful. Among the nations who adopted the week as a division of time, the Chinese, Hindus, Egyptians, Chaldeans, Jews, Persians, and Peruvians have been mentioned, but in some cases the antiquity of the practice is doubtful, and in others the name has been applied to other cycles than that of seven days. The nations with whom the weekly cycle has been traced are the Egyptians and the Hebrews. With the former we only know of its existence, but with the latter it had a much more important character. The use of the week was introduced into the Roman empire about the 1st or 2d century of the Christian era from Egypt, and had been recognized independently of Christianity before the Emperor Constantine confirmed it by enjoining the observance of the Christian Sabbath. With the Mohammedans the week has also a religious character, Friday being observed by them as a Sabbath.

WEEK, Days of the. Sunday (Saxon), Sunnandæg, day of the sun; Monday (German), Montag, day of the moon; Tuesday (Anglo-Saxon), Tiwesdæg, from Tiw, the god of war; Wednesday (Anglo-Saxon), Wodnesdæg, from Odin, the god of storms; Thursday (Danish), Thor, the god of thunder; Friday (Saxon), Frigedæg, day of Freya, goddess of marriage; Saturday, the day of Saturn, the god of time. The names of the seven days of the week originated with the Egyptian astronomers. They gave them the names of the sun, moon, and five

WEIGHTS AND MEASURES

planets, viz.: Mars, Mercury, Jupiter, Venus, and Saturn.

WEeping-ASH, a variety of ash differing from the common ash only in its branches arching downward instead of upward.

WEeping-BIRCH, a variety of the birch-tree, with drooping branches.

WEeping-WILLOW, a species of willow, whose branches grow very long and slender, and hang down nearly in a perpendicular direction.

WEEVER, a name of several fishes, included by many authorities among the perches. Two species, viz.: the dragon-weever, sea-cat, or sting-bull, about 10 or 12 inches long, and the lesser weever, called also the adder-pike, or sting-fish, which attains a length of 5 inches. They inflict wounds with the spines of their first dorsal fin, which are much dreaded. Their flesh is esteemed.

WEEVIL, the name applied to beetles distinguished by the prolongation of the head, so as to form a sort of snout or



Corn-weevil.

a, Insect natural size. b, Insect magnified. c, Larva. d, Egg (both magnified).

proboscis. Many of the weevils are dangerous enemies to the agriculturist, destroying grain, fruit, flowers, leaves, and stems.

WEFT. See Weaving.

WEIGHING MACHINE. See Balance.

WEIGHT, the measure of the force by which any body, or a given portion of any substance, gravitates or is attracted to the earth; in a more popular sense, the quantity of matter in a body as estimated by the balance, or expressed numerically with reference to some standard unit. In determining weight in cases where very great precision is desired, due account must be taken of temperature, elevation, and latitude.

WEIGHTS AND MEASURES, the standards used in accurately weighing and measuring quantities, of special importance in buying and selling, scientific operations, etc. The origin of the English measures is the grain of corn. Thirty-two grains of wheat, well dried, and gathered from the middle of the ear, were to make what was called one pennyweight; 20 pennyweights were called one ounce; and 20 ounces, one pound. Subsequently, it was thought better to divide the pennyweight into 24 equal parts, to be called grains. William the Conqueror introduced into England what was called troy weight. The English were dissatisfied with this weight, because the pound did not weigh so much as the pound at that time in use in England; consequently a mean weight was established, making the pound equal to 16 ounces. But the troy pound was not entirely displaced by the pound avoirdupois; on the contrary it was retained in medical practice, and for the weighing of gold, silver, jewels, and such liquors as were sold by weight. There are 7000 grains in one pound avoirdupois, and

5760 grains in one pound troy; hence the troy pound is to the avoirdupois pound as 14 to 17, or as 1 to 1.215. The troy pound was retained as the British standard by an act passed in 1824; and in order that the standard pound, in case of damage or destruction, might be restored, by reference to a natural standard, it was ascertained that a cubic inch of distilled water, at a temperature of 62° Fahr., weighed, in air, 252.458 grains; and it was directed that the standard pound should be restored by the making of a new standard troy pound, weighing 5760 such grains. In Britain the unit of lineal measure is the yard, all other denominations being either multiples or aliquot parts of the yard. The length of the imperial standard yard, according to the act of parliament passed in 1824, was the straight line or distance between the centers of the two points in the gold studs in the brass rod in the custody of the clerk of the House of Commons, entitled standard yard, 1760. By the same act, the brass rod, when used, must be at the temperature of 62° of Fahrenheit's thermometer. It was enacted at this time that if this standard should be lost or destroyed the length of the yard should be determined by reference to the length of a pendulum vibrating seconds of mean time in a vacuum in the latitude of London, at sea-level. When the standard yard was actually destroyed, however, by the fire which consumed the two Houses of Parliament in 1834, the commissioners appointed to restore the standard decided that it was better to do so by means of authentic copies of the old standard that were in existence. This was accordingly done and five new official copies were made, one of which to be regarded as the national standard, is preserved at the exchequer in a stone coffin in a window-seat of a groined room. The national standard yard is thus the distance between two fine transverse lines on a square rod of gun-metal 38 inches long. In France the mètre is the standard or unit of linear measure; the are, or 100 square mètres, the unit of surface measure; and the stère, or cube of a mètre, the unit of solid measure. The system of measure, called the decimal or metric system, based upon these standards, is now largely adopted. For all sorts of liquids, corn, and dry goods, the British standard measure is declared by the act of 1824 to be the imperial gallon, which should contain 10 lbs. avoirdupois weight of distilled water weighed in air at the temperature of 62° Fahr., the barometer being at 30 inches. The official measurement of this quantity of water measured under the specified conditions gave as the result 277.274 cubic inches, which, though since ascertained to be slightly in excess of the true measurement (277.123 cubic inches), is still the legal capacity of the gallon. In the United States the weights and measures are identical with those of Britain. Prior to 1824 there existed a bewildering irregularity in the weights and measures used in Britain; but since then they have been in great measure regulated by statute, and entire uniformity has been introduced. By the statutes

the imperial standard yard, pound, and gallon are fixed, and all local measures of capacity abolished. The legal stone is fixed at 14 lbs. avoirdupois. All articles sold by weight must be sold by avoirdupois, except gold, silver, platinum, and precious stones, which, as noted above, are still to be sold by troy weight. An act of 1889 fixes fines for being in possession of false weighing or measuring instruments (but such fines were also in force previously); enforces the official stamping of such measures, and empowers the board of trade to create new standards for measuring electricity, temperature, pressure, etc. See Avoirdupois, Troy Weight, Decimal System, etc.

WEIGHTS OF PRODUCE, MINIMUM. The following are minimum weights of certain articles of produce according to the laws of the United States:

	Per Bushel.
Wheat.....	60 lbs.
Corn, in the ear.....	70 "
Corn, shelled.....	56 "
Rye.....	56 "
Buckwheat.....	48 "
Barley.....	48 "
Oats.....	32 "
Peas.....	60 "
White beans.....	60 "
Castor beans.....	46 "
White potatoes.....	60 "
Sweet potatoes.....	55 "
Onions.....	57 "
Turnips.....	55 "
Dried peaches.....	33 "
Dried apples.....	26 "
Clover seed.....	60 "
Flax seed.....	56 "
Millet seed.....	50 "
Hungarian grass seed.....	50 "
Timothy seed.....	45 "
Blue grass seed.....	44 "
Hemp seed.....	44 "
Salt (see note below).....	48 "
Corn meal.....	24 "
Ground peas.....	34 "
Malt.....	20 "
Bran.....	20 "

Salt.—Weight per bushel as adopted by different states ranges from 50 to 80 pounds. Coarse salt in Pennsylvania reckoned at 80 pounds, and in Illinois at 50 pounds per bushel. Fine salt in Pennsylvania is reckoned at 62 pounds, in Kentucky and Illinois at 55 pounds per bushel.

WEI-HAI-WEI, seaport of China, Shantung peninsula, leased to Britain in 1898.

WEIMAR (vi'mär), the capital of the Grand-duchy of Saxe-Weimar. Weimar is closely associated with the names of Schiller, Goethe, Herder, and Wieland, the first three of whom are buried here, and statues to all the four adorn the town. The houses of Goethe, Schiller, Cranach, and Herder, are objects of much interest. Pop. 28,329.

WEIMAR, SAXE. See Saxe-Weimar.

WEIR, Harrison, English artist, was born at Lewes, Sussex, in 1824. His first exhibited picture was in oil, entitled *The Dead Shot*. In 1847 he was elected a member of the new Society of Painters in Water Colors. He is chiefly noted for his pictures of country life, animals, fruits, flowers, and landscapes. As an illustrator of books and periodicals

he is well known. He is the author of *The Poetry of Nature*; *Everyday Life in the Country*; *Animal Stories*; *Old and New*; and *Our Cats*. He died in 1906.

WEISMANN (vis'män), August, German zoölogist, was born January 17, 1834, at Frankfort-on-the-Main. Weismann's epoch-making work on the embryology of the flies appeared in 1864. These investigations were succeeded by his studies on the formation of the egg and the embryology of the little crustaceans *Daphnidæ*, and the origin of the sexual cells of the *Hydro-medusæ*. His researches on the seasonal dimorphism of butterflies, and the origin of the markings of caterpillars, as embodied in his "Studies on the Theory of Descent" were most fruitful. Among his works are: *Essays upon Heredity and Kindred Biological Problems*; *The Germ-Plasm, A Theory of Heredity*; *The All Sufficiency of Natural Selection*; *The Effect of External Influences upon Development*; *New Experiments on the Seasonal Dimorphism of Lepidoptera*.

WELDING is the union produced between the surfaces of pieces of malleable metal when heated almost to fusion and hammered. When two bars of metal are properly welded the place of junction is as strong, relatively to its thickness, as any other part of the bar. Practically, iron is the only metal welded.

WELLESLEY (welz'li), Richard Colley, Viscount and Marquis, and Earl of Mornington, was born at Dublin in 1760. On his majority he took his seat as Earl of Mornington in the Irish House of Peers, and three years after was returned to the British House of Commons as member for Beeralston. Thus, by a curious anomaly, he was at once a peer and a commoner. He distinguished himself in 1789 in the debates on the regency question. In this discussion, his defense of the royal prerogative, made known to George III. after his recovery, pleased him so much that the earl at the next general election was returned for Windsor, and made a member both of the Irish and the English privy-council. These were only preliminaries to the higher appointment of governor-general of India, which was conferred upon him in 1797, along with a British peerage under the title of Baron Wellesley. His administration forms an era in the history of the British Indian empire. He returned to England in 1805, and in 1809 became foreign secretary under Mr. Perceval. In 1812 he resigned his place, chiefly because he was in favor of Catholic emancipation. He did not return to office till 1822, when he became lord-lieutenant of Ireland. This post he retained till 1827. In the Grey ministry he again (1833) became lord-lieutenant of Ireland but finally retired from public life in 1835. He died in 1842.

WELLINGTON, the capital of New Zealand, is situated on Port Nicholson, an inlet of Cook's strait, on the southwest extremity of the provincial district of Wellington, North Island. Pop. 49,344.—The provincial district of Wellington has an area of 11,250 sq. miles. Pop. 141,236.

WELLINGTON, Arthur Wellesley, Duke of, born in 1769. In 1787 he received a commission as ensign in the 73d Foot, and after a rapid series of changes and promotions, attained by purchase in 1793 the command as lieutenant-colonel of the 33d regiment. His regiment landed at Calcutta in February, 1797, at a critical moment for the British power in India. War had just been declared against Tippoo Saib, and an army of 80,000, of which Colonel Wellesley's regiment formed part, marched against him. An engagement took place at Mallavelly (Mysore) on the 27th, in which Wellesley, who commanded the left wing, turned the right of the enemy. Early in 1805, his health failing, Wellesley obtained leave to return home, and arrived in England in September. He had before leaving Madras received his appointment as Knight Commander of the Bath. He was elected M.P. for Rye in 1806, and in April, 1807, was appointed secretary of state for Ireland. In 1809 Wellesley was appointed to take the chief command in the Peninsula, which had been overrun by the French. The famous passage of the Douro, and the defeat of Soult which followed, fittingly opened this masterly campaign. For the victory at Talavera (July 28), the first of a long list that subsequently took place in the peninsula, the government raised the commander-in-chief to the peerage as Viscount Wellington. On August 12, 1812, Wellington entered Madrid. For his brilliant conduct of the campaign thus far he received the thanks of parliament, was raised to the dignity of marquis, and a sum of \$500,000 was voted to purchase him an estate. Next followed the battle of Vittoria (June 21, 1813), for which decisive victory Wellington was given the baton of field-marshal; then battles in the Pyrenees, the capture of San Sebastian, and the crossing of the Bidassoa into France. In 1814 the battle of Orthez was gained, and in the same year the battle of Toulouse, in which Soult's best troops were routed, and the hopes of France in the peninsula utterly annihilated. The way was now open for the British troops to the heart of France. In six weeks, with scarcely 100,000 men, Wellington had marched 600 miles, gained two decisive battles, invested two fortresses, and driven 120,000 veteran troops from Spain. Napoleon abdicated on April 12, and a few days later the war was brought to a close by the signing of conventions with Soult and Berthier. In May the triumphant general was created Marquis of Douro and Duke of Wellington, with an annuity of \$50,000, commuted afterward for \$2,000,000. With the return of peace he resumed the career of politics. He accepted the post of master-general of the ordnance with a seat in the cabinet of Lord Liverpool in January, 1819. In 1822 he represented Great Britain in the congress of Vienna. In 1826 he was appointed high-constable of the Tower. On 22d January, 1827, he succeeded the Duke of York as commander-in-chief of the forces. On 8th January, 1828, he accepted the premiership, resigning the command of the forces

to Lord Hill. In January, 1829, he was appointed governor of Dover castle and lord warden of the Cinque ports. In 1830 repeated motions for parliamentary reform were defeated, but the growing discontent throughout the country on this subject and a defeat in parliament caused the resignation of the government in November. His opposition to reform made the duke so unpopular that he was assaulted by the mob on 18th June, 1832, and his life endangered. He accepted office under Sir Robert Peel in 1834-41, and again in 1846, when he helped to carry the repeal of the corn-laws, which till then he had opposed. In 1842 he resumed the command of the forces on the death of Lord Hill. He died at Walmer castle, 14th September, 1852.

WELLMAN, Walter, American journalist and explorer, was born in Mentor, Ohio, in 1858. In 1869 he founded the Cincinnati Evening Post, and after 1884 he was the Washington correspondent successively of the Chicago Herald and the Chicago Times-Herald. In 1894 he led an expedition to the Arctic regions and reached a point on the eighty-first degree of latitude, northeast of Spitzbergen. In 1898-99 he made another expedition to the Arctic regions, spending the winter of 1898-99 there, and reaching latitude 82°. Wellman reported the discovery of some twenty new lands or islands.

WELLS, Horace, American dentist, was born in Hartford, Vt., in 1815. He conceived the idea that an anæsthetic might be used in dentistry to prevent pain, and had thought of the employment of nitrous oxide gas as early as 1840. In 1847 he published *A History of the Discovery of the Application of Nitrous Oxide Gas, Ether, and Other Vapors to Surgical Operations*. His constant experiments upon himself with chloroform produced mental alienation, and in 1848 he committed suicide.

WEN, an encysted tumor occurring on the scalp or other parts of the body. They are formed by the accumulation of sebum in a hair follicle, or in the recesses of the sebaceous gland of the hair sac, causing distension of the sac. An encysted tumor, in its commencement, is always exceedingly small, and perfectly indolent; and it is often many years before it attains any great size. The best mode of treatment is complete removal of the whole swelling by dissecting it out.

WENER, the largest lake of Sweden, and after those of Ladoga and Onega the largest in Europe, situated in the southwest of the kingdom. It is 147 feet above sea-level, and of very irregular shape. Its greatest length, northeast to southwest, is about 100 miles; and its breadth may average about 30 miles; area, 2306 sq. miles. Its chief feeder is the Klar. By a canal it communicates with Lake Wetter, but its only proper outlet is at its southwestern extremity, where its superfluous waters are received by the river Gotha. In winter it is frozen for several months, and crossed by sledges. It abounds with fish.

WENTWORTH, Sir Thomas, Earl of Strafford. See Strafford.

WEREWOLF, a man-wolf, a man

transformed into a wolf according to a superstition prevalent in ancient and mediæval times. It was generally thought that such beings had the form of a man by day, and that of a wolf by night.

WERNER (vēr'nēr), Abraham Gottlob, a German mineralogist, born 1750, died 1817. Werner was the first to separate geology from mineralogy, and to place the former on the basis of observation and experience. The great geological theory with which his name is connected is that which attributes the phenomena exhibited by the crust of the earth to the action of water, and is known as the Wernerian or Neptunian theory, in distinction to the Huttonian or Plutonic, in which fire plays the chief part.

WESER (vā'zēr), a river of Germany, formed by the junction of the Fulda and Werra at Münden, flows generally in a northwest direction, and, after a very circuitous course, traverses the city of Bremen, and then falls by a wide mouth, very much encumbered with sandbanks, into the German ocean. Its length, including the Werra, is about 430 miles. The navigation for vessels of large size ceases about 10 miles below Bremen. See Bremen.

WESLEY, John, the founder of Wesleyan Methodism, was born at Epworth, Lincolnshire June 17, 1703. He took his degree of B.A. in 1724, was ordained deacon in 1725, became a fellow of Lincoln college, and lecturer and moderator in classics in 1726; and took priest's orders in 1728. He now gathered together a number of pupils and companions who met regularly for religious purposes, and by so doing acquired the name of Methodists. Among these com-



John Wesley.

panions were Hervey, Whitefield, and Law, the author of the *Serious Call to the Unconverted*. In 1735 Wesley accepted an invitation from General Oglethorpe to go out to America to preach to the colonists of Georgia. After a stay of two years he returned to England (February, 1738). Early in the following year (1739) he began open-air preaching, in which he was closely associated with Whitefield, from whom, however, he soon separated. Having now the sole control of the religious body



which adhered to him, he devoted his entire life without intermission to the work of its organization, in which he showed much practical skill and admirable method. His labors as an itinerant preacher were incessant. He would ride from 40 to 60 miles in a day. He read or wrote during his journeys, and frequently preached four or five times a day. He died in 1791.

WESLEYAN METHODISTS. See Methodists.

WESSEX, that is, West Saxons, one of the most important of the Anglo-Saxon kingdoms in England during the 6th, 7th, and 8th centuries, and the early part of the 9th, and that in which the other kingdoms were ultimately merged in the reign of Egbert in 827. It included the counties of Devon, Dorset, Somerset, Wilts, Berks, and a part of Cornwall.

WEST, Benjamin, painter, born at Springfield, Pennsylvania, in 1738; died in London in 1820. In July, 1760, he visited Italy, and settling in Rome painted Cimon and Iphigenia, and Angelica and Medora. He visited England in 1763, and was so well patronized that he determined to make it his future residence. He painted Hector and Andromache, The Return of the Prodigal Son, and a historical painting of Agrippina. He painted a series of historical works for Windsor castle, and for the oratory there a series on the progress of revealed religion. On the death of Reynolds, in 1792, he was elected president of the Royal academy. He afterward painted a number of religious and historical pictures of large size, among them being Christ Healing the Sick (in the National gallery), the Crucifixion, Ascension, and Death on the Pale Horse. The Death of General Wolfe at Quebec and The Battle of La Hogue are accounted the best of his historical pieces.

WEST BAY CITY, a city in Bay co., Mich., on the Saginaw river, opposite Bay City, and on the Michigan Central, the Detroit and Mackinac, and the Grand Trunk railroads, connected with Bay City by four bridges. Pop. 15,119.

WEST CHESTER, the county seat of Chester co., Pa., 25 miles west of Philadelphia, on the Pennsylvania and the Philadelphia, Baltimore and Washington railroads. It is in a productive farming section, known for its grain interests, and having extensive nurseries. Pop. 10,942.

WESTERN AUSTRALIA, a British colony which includes all that portion of the continent situated westward of 129° e. lon. The territory measures 1490 miles from n. to s., and 850 miles from e. to w. The total estimated area is 978,299 sq. miles, thus making it the largest of the Australian colonies. The really occupied portion, apart from scattered settlements round the coast is almost entirely in the southwest, and is about 600 miles in length and 150 miles in average breadth. Western Australia was first settled in 1829 as the Swan river settlement and for many years the population was very small; but in the year 1906 it had risen to over 200,000.

WEST HOBOKEN, a town in Hudson co., N. J.; 160 feet above tide-water;

1½ miles W. of Hoboken ferry on the Hudson river, directly opposite New York. It is principally engaged in the manufacture of silk goods. Pop. 26,172.

WEST INDIES, also called the Antilles, the extensive archipelago which lies between North and South America, stretching from Florida to the shores of Venezuela. It is divided into the Bahamas, the group stretching from near the coast of Florida in a southeasterly direction; the Greater Antilles, comprising the four largest islands of the group, Cuba, Hayti, Porto Rico, and Jamaica; and the Lesser Antilles, stretching like a great bow, with its convexity toward the east, from Porto Rico to Trinidad, near the coast of Venezuela. Almost the whole archipelago lies within the torrid zone. The total area does not exceed 95,000 sq. miles, of which the Greater Antilles occupy nearly 83,000 sq. miles. The climate is extremely hot, and the islands abound in tropical productions, as sugar, cotton, coffee, tobacco, corn, etc.; oranges, lemons, limes, pomegranates, citrons, pineapples, etc.; manioc, yams, potatoes, etc. Except Hayti (which is independent) and a few islands off the coast of South America, the West Indian islands are in the possession of European powers. The chief British possessions are: Jamaica, Barbadoes, St. Lucia, St. Vincent, Trinidad, Tobago, Antigua, St. Kitt's, Dominica, Virgin islands, and the Bahamas.—Dutch: St. Eustatius, Saba, St. Martin (partly French), Bonaire or Buen Ayre, Curaçao, and Oruba or Aruba.—French: Martinique, Deseada, Guadeloupe, Marie Galante, St. Martin (partly Dutch), St. Bartholomew, Les Saintes.—United States: Porto Rico.—Danish: Santa Cruz, St. Thomas, and St. John. Cuba is independent under the suzerainty of the United States.

WESTINGHOUSE, George, American inventor and engineer, was born at Center Bridge, Schoharie co., N. Y., in 1846. Invented at 15 a rotary engine. In 1864 he became assistant engineer in the United States navy. His next invention was a railway frog. In 1868 he invented the air brake which soon was used universally in the United States. Soon after he became interested in electricity and acquired patents for alternating current machinery. A large plant was erected at Pittsburg to manufacture air brakes, electrical, and other machines, and at these works the great power plants at Niagara Falls were constructed. Large factories and works have also been established in Europe. His invention of the air-brake and of automatic railway signals have been largely instrumental in the possibility and safety of modern high speed railroading. He has been decorated with the French Legion of Honor, the Royal Crown of Italy, and the Order of Leopold.

WESTMACOTT, Sir Richard, sculptor, born in London in 1775. Many of the monuments in St. Paul's are from his chisel. He designed also the Achilles in Hyde Park, the statue of Lord Erskine in Lincoln's Inn Old Hall, that of Nelson in the Liverpool exchange, besides statues of Addison, Pitt, etc. He was elected an associate of the Royal

Academy in 1805, a full member in 1816, and in 1827 succeeded Flaxman as lecturer on sculpture. In 1837 the dignity of knighthood was conferred on him. He died in 1856.

WESTMEATH, a county in Ireland, in the province of Leinster, with an area of 434,000 acres. Pop. 61,527.

WESTMINSTER, a city, parl. and mun. bor. of Middlesex, England, in what is now the county of London. Within the city area are Westminster Hall, Abbey, and School, Kensington Palace, the Houses of Parliament, the Whitehall banqueting house, etc. Westminster had a royal residence as early as the time of Edward the Confessor. Pop. 182,977.

WESTMINSTER ABBEY, the coronation church of the sovereigns of England, and one of the chief ornaments of London, is a magnificent Gothic pile, situated near the Thames, and adjoining the Houses of Parliament. In 1065 a church was built here in the Norman style by Edward the Confessor. Part of this structure still remains in the pyx-house and the south side of the cloisters; but the main building, as it now stands, was begun in 1220 by Henry III. (who built the choir and transepts), and was practically completed by Edward I. Various additions, however, were made (including the nave and aisles, the west front, and the Jerusalem Chamber) down to the time of Henry VII., who built the chapel which bears his name, while the upper parts of the two western towers were designed by Sir C. Wren. The extreme length of the church, including Henry VII.'s chapel, is 531 feet; breadth of transepts, 203 feet; height of the roof, 102 feet; height of towers, 225 feet. The coronation ceremony takes place in the choir, where the coronation stone brought by Edward I. from Scotland is situated beside the coronation-chairs of the English sovereigns. Westminster Abbey is distinguished as the burial-place of numerous English kings from Edward the Confessor to George II.; the north transept is occupied chiefly by monuments to warriors and statesmen; while in the south transept is situated the "Poet's Corner," the burial and memorial place of most of England's great writers from Chaucer to Browning and Tennyson. See London.

WESTMORELAND, a county in England, bounded by Cumberland, Lancashire, Morecambe bay, Yorkshire, and Durham; area, 500,906 acres, or 783 sq. miles. Much of the celebrated lake-scenery of England is within the limits or on the borders of this county, the chief lakes being Ulleswater, Grasmere, Rydal Water, and Windermere. The principal rivers are the Eden, Lune, and Kent. The minerals include graphite roofing-slate, marble, and small quantities of coal, lead, and copper. The arable land is mostly confined to the valleys, while the greater part of the remaining surface is in natural pasture, or under wood. Appleby is the chief town. Pop. 64,305.

WESTON, Edward, American electrician, born in 1850 in London, England, but in 1870 came to the United States. He improved the process of

WESTPHALIA

nickel-plating, made investigations in electricity, and in 1875 established at Newark, N. J., the first factory in the United States exclusively for the manufacture of dynamo-electric machines. His inventions included improved meters for electric measurements.

WESTPHALIA, the name given at different periods to (1) one of the circles of the old German empire, (2) one of Napoleon's kingdoms (1807-13), conferred upon his brother Jerome; and (3) now to a province of Prussia. The latter is bounded by Rhenish Prussia, Holland, Hanover, Brunswick, Hesse, and Nassau. Its area is 7771 sq. miles. Besides iron and coal in abundance the minerals include copper, lead, zinc, and salt; and the manufactures are varied and important. Münster is the capital. Pop. 2,700,250.

WESTPHALIA, Peace of, the name given to the peace concluded in 1648 at Münster and Osnabrück, by which an end was put to the Thirty Years' war (which see). By this peace the sovereignty of the members of the empire was acknowledged. The concessions that had been made to the Protestants since the religious peace in 1555 were confirmed. The elector-palatine had the palatinate of the Rhine and the electorate restored to him; Alsace was ceded to France; Sweden received Western Pomerania, Bremen, Verden, Wismar, and a sum equal to \$3,750,000; Brandenburg, Mecklenburg, Hanover, and Brunswick were compensated by the secularization of numerous ecclesiastical foundations. The independence of the United Provinces was recognized by Spain, and that of Switzerland by the empire.

WEST POINT, Orange co., N. Y., on the Hudson river, 52 miles north of New York. It is situated on a series of high bluffs overlooking the river, which takes a sharp bend at this point, and from the time of the revolutionary war has been an important military post. In 1794 the United States military academy was located here by act of congress, the act authorizing the enrollment of a corps of artilleryists to garrison the forts, and providing for the attachment of thirty-two cadets to the force. Four years later the corps was enlarged, instructors appointed, and the cadets given definite rank in the army. Formerly they were enlisted for five years, but the term is now extended to eight. The commandant and officers detailed at the post serve only four years, while the professors with the rank of lieutenant colonel or colonel, after ten years' service, are appointed for life. The cadets are divided into battalions of four infantry companies, each commanded by an officer of the regular army and under him by cadet officers. Each congressional district and territory and the District of Columbia is entitled to have one cadet at the academy, the cadet to be named by the representative in congress from the district. There are also ten appointments at large made by the president. Admission is gained by passing a satisfactory examination. The number of cadets is about three hundred. The pay of each cadet is \$540 per year, out of which all of his expenses are paid. Upon graduating a cadet re-

ceives an appointment as second lieutenant in the United States army.

WEST TROY, a town of Albany co., New York, on the right bank of the Hudson, opposite the town of Troy, and connected by an iron bridge. Pop. 14,140.

WEST VIRGINIA, a south Atlantic state of the United States, bounded on the northeast by Pennsylvania and Maryland, on the southeast and south by Virginia, on the southwest by Kentucky, and on the northwest by Ohio, being separated from the latter state by the Ohio river. Area 24,780 sq. miles. It ranks thirty-seventh in size among the states. The surface is uneven and in the east mountainous. The main range of the Alleghanies crosses the northeastern section, and farther south forms the state boundary toward Virginia. The state is drained by a number of rivers flowing from the mountain belt northward to the main river on

important are salt, sandstone, limestone, and clay. There are also a large number of valuable minerals springs, especially sulphur. The soil in the western part of the state consists of rich clay and sand loams, well suited to general farming. The flat hills to the eastward are better adapted to grazing. Wheat, corn, buckwheat, oats, and rye are the chief cereals. Tobacco and sorghum cane are the other important crops. Apples constitute 70 per cent of the fruit crop. Cattle, horses, and sheep are the principal stock raised. The iron and steel industry ranks first among the manufactures. In the manufacture of coke the state ranks second. The availability of natural gas has led to a thriving glass-manufacturing industry. Pottery, terra cotta, fire clay products, flour and grist milling, tanning and leather are the other principal industries. West Virginia has excellent transportation facilities. The navigable streams include the Ohio, Monongahela, Great and Little Kanawha, and the Big Sandy. The bulk of the state's foreign trade is carried on by way of the Ohio, which offers means of water communication with the gulf. There are three trunk lines traversing the state from east to west—the Chesapeake and Ohio, the Baltimore and Ohio, and the Norfolk and Western. The population by decades has been as follows: 1870, 442,014; 1881, 618,457; 1890, 762,794; 1900, 958,800. Estimated population in 1908 by the governor of the state 1,200,000. Among the institutions of higher education are: The University of West Virginia, at Morgantown; Bethany college, at Bethany; and Morris Harvey college, at Barboursville. For a number of years after the settlement of the eastern part of Virginia the western section was entirely unknown. In 1669 La Salle floated down the Ohio river and landed at several places within the state. Governor Spotswood of Virginia made an expedition into the present state in 1716. The establishment of West Virginia as a state was consummated on June 20, 1863. Its creation and admission were due to conditions which existed prior to the civil war of 1861-5, to popular sentiment which those conditions developed when the war was precipitated, and to the exigencies of the war itself. The western part of Virginia was sparsely peopled, its great forests undeveloped, its vast mineral resources only partially realized, and its slave interests comparatively small. The eastern section contained the larger population, owned the great bulk of slave property, and exercised controlling power over state affairs. The Alleghanies, dividing the two sections, in the absence of transverse railroad facilities, naturally sent the citizens of one side with the flow of their navigable waters to western and southern markets, while those of the other, moved by similar natural causes, turned to the seaboard for their commercial and business intercourse. The basis of taxation, the basis of representation, and the relation of the slave interests to these with the measure and distribution of public funds for works of internal improvement and other questions of local concern, constituted elements of con-



Obverse.



Reverse.

Seal of West Virginia.

the boundary. The largest of these rivers are the Big Sandy, the Guyandotte, Great Kanawha, Little Kanawha, and Monongahela. The climate is agreeable and healthful, with freedom from violent extremes of heat or cold. The rainfall ranges from 33 inches in the northeast to 45 inches in the south. In the northeast the soils are sandy and of little fertility; many of the mountains are covered with a fertile clayey soil, and the Ohio valley has a soil formed chiefly from limestone, which gives it great fertility. There are in the southeast and south dense forests of deciduous trees; black, red, white, and chestnut oak, hickory, chestnut, locust, maple, and tuplip-trees. There are also extensive forests of black spruce, white pine, and hemlock and birch on the mountains.

West Virginia includes 16,000 sq. miles of the Alleghany coal measures, chiefly bituminous. There are immense deposits of petroleum and rich reservoirs of natural gas. Iron ore is found, and among non-metallic minerals the most

tinual controversy, and served to detract largely from the homogeneity of the population. When Virginia passed the ordinance of secession there was much dissatisfaction. Representatives from forty counties declared their independence of Virginia, and took measures for the establishment of a provisional government. During the war 32,068 men were furnished to the federal army. Slavery was entirely abolished in advance of the adoption of the thirteenth amendment. The vote of the state was cast for republican electors previous to 1870. From 1872 to 1892 democratic candidates were uniformly successful. In 1896, 1900, 1904 and 1908, the state went Republican.

WEST VIRGINIA UNIVERSITY, a coeducational state institution of higher learning at Morgantown, West Va., founded in 1868. It absorbed the West Virginia Agricultural college (founded 1867), the Monongahela academy (founded 1814), and the Woodburn Seminary. It now comprises colleges of art and sciences, engineering and mechanical arts, agriculture, and law, schools of music, military science and tactics, and commerce, and preparatory schools at Morgantown, Montgomery, and Keyser. Its principal sources of support are the land grant of 1862, the Morrill and Hatch funds, and biennial state appropriations.

WEXFORD, a maritime county in Ireland, in the province of Leinster, bounded by Wicklow, St. George's Channel, the estuary of the Suir and Barrow, Waterford Harbor, Kilkenny, and Carlow; area, 575,700 acres. Pop. 103,860.—Wexford, the county town, is a seaport on the river Slaney, where it enters Wexford harbor. Pop. 11,154.

WHALE, the common name given to the larger mammals of the order Cetacea. They are characterized by having fin-like anterior limbs, the posterior limbs being absent, but having their place supplied by a large horizontal caudal fin or tail. The whalebone whales are distinguished by the absence of teeth, by the presence of baleen or whalebone in

or cachalot averages from 50 to 70 feet in length. Some species of the Delphinidae or dolphin family are also known as whales. Whale fishing for the sake of the oil and whalebone has been an important industry since the 12th century. It was for long prosecuted with great energy by the Dutch, English, French, and Americans, but of recent times it has greatly decreased, chiefly on account of the scarcity of whales. The instruments used in the capture of the whale are the harpoon and the lance. The harpoon is an iron weapon about 3 feet in length, terminating in an arrow-shaped head. This is attached to a line, and is thrown at the whale by hand, so as to transfix it, or is discharged from a small swivel cannon placed in a boat. The lance is a spear of iron about 6 feet in length, terminating in a thin, sharp steel head. These, with the necessary lines, boats, etc., are all the apparatus required for capturing the whale. When captured the animal is cut up, the blubber boiled and the oil extracted, and the whalebone dried.

WHALEBACK STEAMERS, vessels in which the hull has a form roughly resembling the back of a whale. The designer was Alexander McDougall, a sea-captain of Duluth, Minn., who brought them out about 1890. They have proved to be very moderate in their demand for power. The section of the vessel is oval, the decks as well as the bilges are rounded, and driven by steam-power solely, and are both easy to propel and quiet in motion. The seas are taken over them without obstruction, and pro-

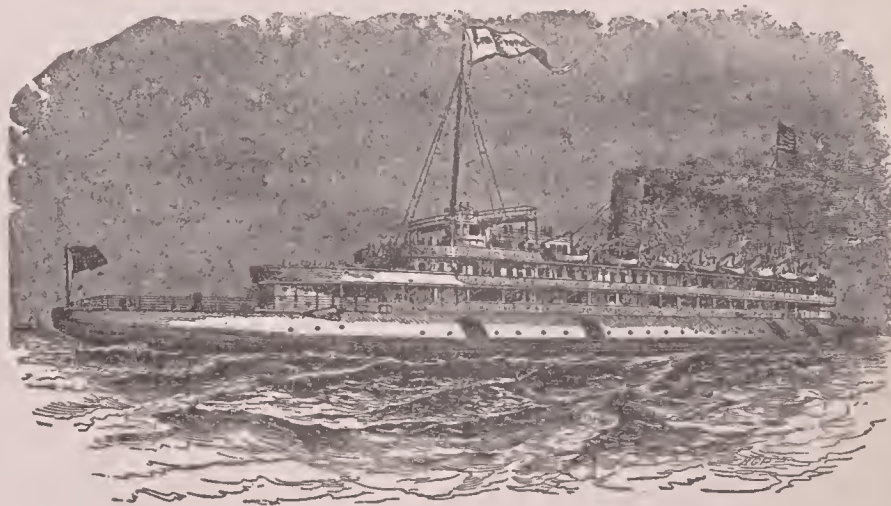
WHALEBONE, or **BALEEN**, a well-known elastic horny substance which hangs down in thin parallel plates from the sides of the upper jaw of whales. These plates vary in size from a few inches to 12 feet in length; the breadth of the largest at the thick end, where they are attached to the jaw, is about a foot, and the average thickness is from four to five-tenths of an inch. From its flexibility, strength, elasticity, and lightness, whalebone is employed for many special purposes, but it is now rather an expensive material. In commerce the plates of baleen are often called whale-fins.

WHEAT, the most important species of grain cultivated in the United States and Europe, and a very important crop in India, Australia, etc. It grows readily in almost every climate; but its natural home seems to be a temperate climate, and the soils best adapted for its culture are rich clays and heavy loams. Of cultivated wheats there are many varieties, the differences, however, being mostly due to soil, climate, and mode of cultivation. Three primary varieties may be mentioned: (a) winter or unbearded wheat; (b) summer or bearded wheat; (c) spelt or German wheat, which is of much less value than the others, but grows on poorer soils and more elevated localities. White wheat and red wheat are names applied according to the color of the grain, the red sorts being generally harder than the white, but of inferior quality, and the yield is less. Winter wheat is sown in the autumn, with the view of being



Greenland whale.

the mouth. The typical representative of this family is the common or Greenland whale, so valuable on account of the oil and whalebone which it furnishes. It is principally found in the Arctic seas, but it is also found in considerable numbers in many other parts of the world. Its length is usually about 60 feet, and its greatest circumference from 30 to 40 feet. Allied to the Greenland whale is the rorqual. It often measures about 100 feet in length, and from 30 to 35 feet in circumference. The sperm whale



A whaleback steamer, the Christopher Columbus.

duce no effect upon the movement of the ship. Whaleback steamers have been used mainly as grain-carriers, but the Christopher Columbus was employed throughout the period of the World's Columbian exposition, in Chicago in 1894, to carry passengers between the city and the exposition-grounds, and proved a great success. She now plys as a passenger-steamer between Chicago and Milwaukee, carrying as many as 3000 passengers. This ship is 362 feet over all, 42 feet beam, and 24 feet deep, driven by triple-expansion engines of 2,600 horse-power. Her average speed is nearly 20 miles an hour.

harvested the following year; summer wheat is sown in the spring of the year in which it is reaped.

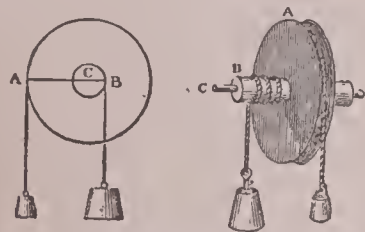
WHEATON, Loyd, American soldier, was born in Fairfield, Calhoun county, Mich., in 1838. He entered the federal army as a first sergeant in the Eighth Illinois Infantry and became a captain in March, 1862, a major in August, 1863, and a lieutenant-colonel in November, 1864, in the volunteer service. He took part in Custer's expedition to the Black Hills. In May, 1898, during the Spanish-American war, he was made a brigadier-general of volunteers, and commanded for a short time the first division of the Seventh

WHEATSTONE

Army Corps in Cuba. He was sent to the Philippines early in 1899; in 1900 became commander of Northern Luzon. He was made major-general in the regular army in 1901, and in July, 1902, was retired from the service.

WHEATSTONE, Sir Charles, scientific investigator and discoverer, born at Gloucester in 1802, died at Paris in 1875. In 1823 he attracted the attention of men of science by the publication in Thomson's *Annals of Philosophy* of a paper entitled *New Experiments on Sound*. This was followed by a number of other papers, some of them describing inventions of his own, all of which are remarkable for their ingenuity. In 1836 he exhibited at King's college experiments showing the velocity of electricity, which suggested to him the idea of applying his apparatus to telegraphing, and in 1837, in conjunction with W. F. Cooke, he took out the first patent for the electric telegraph. He was a fellow of the Royal Society from the year 1836, and in 1868 he received the honor of knighthood.

WHEEL, an instrument of torture formerly employed in France and Germany, on which the criminal was placed with his face upward, and his legs and arms extended along the spokes. On the wheel being moved round the executioner broke the wretch's limbs by



Wheel and axle.

successive blows with a hammer or iron bar, and after a more or less protracted interval put an end to the sufferings of his victim by two or three severe blows, called coups de grâce (mercy strokes), on the chest or stomach or by strangling him. In Germany its use lingered down till the beginning of the 19th century.

WHEEL AND AXLE, one of the mechanical powers, which consists of a wheel round the circumference of which a string may be wound, having a small weight attached to its free end, and an axle whose circumference, being smaller than that of the wheel, will sustain a heavier weight at the end of a string which is wound upon it in the opposite direction to that of the string on the wheel. The wheel and axle is merely a case of the lever, *c* in the figures being the fulcrum, while *a* *c* and *b* *c*, the radius of the wheel and axle respectively are the longer and shorter arms of the lever. Hence the small weight in ounces or other measure of weight multiplied by the radius of the wheel is equal to the balancing weight on the axle multiplied by the radius of the axle. In a great many cases a crank takes the place of the wheel, the circle described by the handle corresponding to the circumference of the wheel. The common winch, the windlass, the capstan, and the tread-mill are so many applications of the wheel and axle; and the same

principle may be adapted to a train of wheel-work wherein motion is regulated and power acquired.

WHEELING, a city and port in West Virginia, capital of Ohio county, on the east or left bank of the Ohio river, 92 miles below Pittsburg. It is the most important place on the river between Pittsburg and Cincinnati, and in respect to trade, manufactures, and population the most considerable town of the state. Coal is largely worked in the neighborhood; there are iron-foundries and cotton, nail, glass, and paper works; cotton, silk, and steam-engine manufactories and a brisk traffic by river and railroad. Pop. 49,642.

WHEELER, Benjamin Ide, American educator, was born at Randolph, Mass., in 1854. In 1886 he became professor of comparative philology in Cornell university, and two years later professor of Greek. In 1899 he became president of the University of California. Among his published works are: *Der griechische Nominalaccent*, *Analogy*, and *the Scope of Its Application in Language*, *Introduction to the Study of the History of Language*, in collaboration with H. A. Strong and W. S. Logeman, *Principles of Language Growth*, *The Organization of Higher Education in the United States*, and *Life of Alexander the Great*.

WHEELER, Joseph, American soldier, born in Augusta, Ga., in 1836. He entered the confederate service in 1861 as colonel of an Alabama regiment of infantry, to serve in the west. He was present at the battle of Shiloh, and the same year led the cavalry in the army under Gen. Braxton Bragg. In 1862 he was made brigadier-general, and January 19, 1863, was promoted to be major-general. He commanded the cavalry at the battle of Chickamauga, defeated Stoneman in July, 1864, capturing that officer, with many prisoners and all his artillery, and the same year defended Savannah, Ga., and Aiken, S. C. On February 28, 1865, he was promoted to be lieutenant-general, and continued in charge of the cavalry under Gen. Joseph E. Johnston until the end of the war. Later he was sent to congress, and in January, 1888, became a regent of the Smithsonian institution. In 1880 he was elected to congress as a democrat and was a member continuously until 1899. In May, 1898, he was appointed by President McKinley a major-general of volunteers. He commanded the troops in the engagement of Las Guasimas, and was senior field officer in the battle of San Juan Hill and commanded a brigade in the Philippine islands; was commissioned a brigadier-general in the regular army in 1901 and retired in September, 1901. He published *The Santiago Campaign* 1898. He died in 1906.

WHEELER, William Almon, vice-president of the United States, from 1877 to 1881, was born at Malone, N. Y., 1819. He was admitted to the bar in 1843, served several terms in the state legislature, and as president of the state constitutional convention of 1867, and was a member of the house of representatives from 1861 to 1877. He was nominated for the vice-presidency in 1876 by the republicans, and was seated,

after a contest before the electoral commission. He died in 1887.

WHERRY, a light, shallow boat, seated for passengers, and plying on rivers.

WHEY. See Milk.

WHIP-POOR-WILL, the popular name of an American bird allied to the European goat-sucker or night-jar, and so called from its cry. It is very common in the eastern parts of the United



Whip-poor-will.

States; is about 10 inches long, and feeds on flying moths and other insects. Its note is heard in the evening, or early in the morning. During the day these birds retire into the darkest woods.

WHIRLPOOL, a circular eddy or current in a river or the sea produced by the configuration of the channel, by meeting currents, by winds meeting tides, etc., as those of Charybdis, the Maelstrom, and Corryvreckan.

WHIRLWIG, WHIRLWIG-BEETLE, a beetle which abounds in fresh water and may be seen circling round on its surface with great rapidity. Its eyes are divided by a narrow band, so that, although it has only two, it is made to look as if it had four.

WHIRLWIND, a violent wind moving in a spiral form, as if moving round an axis, this axis having at the same time a progressive motion. Whirlwinds are produced chiefly by the meeting of currents of air which run in different directions. When they occur on land they give a whirling motion to dust, sand, etc., and sometimes even to bodies of great weight and bulk, carrying them either upward or downward, and scattering them about in all directions. At sea they often give rise to water-spouts. They are most frequent and violent in tropical countries.

WHISKY, the name applied to an ardent spirit distilled generally from barley, but sometimes from wheat, rye, sugar, molasses, etc. There are two chief varieties of whisky—viz. malt-whisky and rye-whisky. The former variety is of finer quality, and made chiefly from malted barley or bere, and sometimes, though rarely, from rye. The latter is made from various substances, as sugar, molasses, potatoes, but principally from unmalted grain, as Indian corn, barley, oats, etc., dried and ground up. The grain most largely used is Indian corn. Grain-whisky requires the same process of fermentation and distillation as malt-whisky, but is cheaper, from its greater yield, and because it saves the expensive process of malting. Though coarser, it is stronger,

but if kept long enough is equally good. See Distillation.

WHIST, a well-known game at cards. The game is played with the full pack of fifty-two cards by four persons, two being partners against the other two, each player receiving thirteen cards dealt out one by one in rotation. The last card dealt is turned face up, and is called the trump card; it gives a special power to the suit to which it belongs. The cards rank as follows: ace (highest), king, queen, knave, and the others according to their number of pips. Play is commenced by the person on the left hand of the dealer laying down a card face up on the table, the other players following in succession with cards of the same suit if they have them. When all have played the player who has laid the highest card takes the four cards laid down, which constitute a trick. The winner of the trick then leads, as the first of a new trick, the winner of which becomes the leader, and so on. When a player cannot play a card of the same suit, he may play one of the trump suit, and take the trick, or lay one of a different suit, which gives him no chance of winning the trick. When the hand is played out the score is taken as follows: the partners who conjointly gain the majority of tricks score one point for every trick taken above six. The ace, king, queen, and knave of the trump suit are called honors, and count one each for the side who holds them; if one side hold three honors, they count two by honors, as the opposite side can have but one; if one side hold all the honors, four by honors is counted; should the honors be equally divided neither side counts, the honors being then said to cancel each other. In long whist, an obsolescent form of the game, ten of these points made a game. In short whist, the game now generally played, the number has been reduced to five, and in this form it is common to count by tricks alone. A rubber consists of a series of three games, and is won by the side that secures two of them. Should one party gain two games in succession, the third of the rubber is not played.

WHISTLER, James Abbott McNeill, painter, was born in Lowell, Mass., in 1834; was educated at the United States Military academy, studied drawing and painting in Paris, France, and in 1863 settled in London, England. He held original views concerning his art, and has made interesting experiments with color, in quest of novel effects. Mr. Whistler was also celebrated as an etcher and was the author of etchings and paintings of established reputation and worth. His *Little White Girl* achieved a signal success. His *Little French Series*, representing Parisian views, some of a genre character, established his reputation, and the wonderful *Thames Series* placed him in the first rank. His later subjects were taken from Holland, France, and other localities which he visited, but the best known are the *First Venice Series* and the *Second Venice Series*. They are the culmination of his etching, and place him in the same rank with Rembrandt, the world's greatest etcher, whom he even excels in selection

and subtlety of execution. His portraits of Carlyle, Rose Whistler, Lady Archibald Campbell, Theodore Duret, Comte de Montesquieu, Sarasate, the violinist, are masterful. In 1887 he was elected president of the Royal Society of British Artists. At the close of 1889, when he received the Cross of the Legion of Honor (Officer, 1891). He was made honorary member of the academies of Munich, Dresden, Rome, etc., Knight of the Bavarian Order of Saint Michael, and in 1900 he received the gold medal at the Paris exposition. He died in 1903.

WHITE, Andrew D., college president and diplomat, was born in Homer, N. Y., 1832. In 1858 he became professor of history and English literature at the University of Michigan. In 1863 he was elected to the New York state senate. At the expiration of his term in the senate, he was elected first president of Cornell university, a position which he held until 1885, when he resigned on account of ill health. In 1867 and 1868 he visited Europe to make a study of foreign school organization. In 1871 he was a member of the United States commission on San Domingo. And from 1879 to 1881 he was minister to Germany, and from 1892-4 to Russia, and from 1897 to 1902 ambassador to Germany. In 1888 he was elected regent of the Smithsonian institution in the place of Asa Gray, and in 1899 member of the peace commission at The Hague. He is the author of many valuable scientific works.

WHITE, Edward Douglas, associate justice of the supreme court of the United States, was born in Louisiana, in 1845. He was educated at Mt. St. Mary's college, Emmetsburg, at the Jesuit college of New Orleans, and the Georgetown university. He served in the confederate army and afterward practiced law. In 1874 he was elected state senator of Louisiana, and was appointed associate justice of the supreme court of Louisiana in 1878, and elected to the United States senate in 1891. In 1894, while serving as senator, he was appointed associate justice of the supreme court of the United States.

WHITE, Richard Grant, American author, was born in New York City in 1825. His literary tendencies drew him from law, and his musical, dramatic, and art criticisms gave him prominence. He occupied a place among the most learned Shakespearian scholars. He died in 1885.

WHITE, Hugh Lawson, American statesman, was born in Iredell county, N. C., in 1773. He served in the Cherokee war as a private. In 1825 he succeeded Gen. Andrew Jackson in the United States senate. He stood as a candidate for the presidency in 1836 and received the electoral votes of Georgia and Tennessee. He died in 1840.

WHITE, John Blake, American painter, was born at Eutaw Springs, S. C., in 1781. His best known painting was the *Unfurling of the United States Flag* in the City of Mexico. Other paintings by him include the "Battle of New Orleans," "General Marion inviting the British Officer to Dinner," etc., etc. He was repeatedly elected to the South Carolina legislature. He died in 1859.

WHITE-BAY, a tree that grows in wet ground in the United States. The bark and seed-cones are used as tonics.

WHITE-BEAR. See Bear.

WHITEBOYS, an illegal association formed in Ireland about 1760. The association consisted of starving day-laborers, evicted farmers, and others in a like condition, who used to assemble at nights to destroy the property of harsh landlords or their agents, the Protestant clergy, the tithe collectors, or any others that had made themselves obnoxious in the locality. In many cases they did not confine their acts of aggression merely to plunder and destruction, but even went the length of murder.

WHITEFIELD, George, founder of the Calvinistic Methodists, was born in 1714 at Gloucester. At the age of eighteen he became acquainted with the Wesleys, and joined the small society which procured them the name of Methodists. In 1738 he went to the American settlement of Georgia, where his ministrations gave great satisfaction to the colonists. In the following year he returned to England to procure subscriptions for building an orphan-house in the settlement. Having taken priest's orders, he repaired to London, where the churches in which he preached proved incapable of holding the crowds who assembled to hear him. He now adopted preaching in the open air. After visiting many parts of England, Scotland, and Wales he again returned to America, and remained there nearly four years. Soon after his return he was introduced to the Countess of Huntingdon, who made him one of her chaplains. On his seventh visit to America, he died at Newburyport, Mass., 1770.

WHITEHALL, a locality in Westminster, where are the admiralty office and that of the commander-in-chief (the Horse Guards), etc. On the bank of the Thames was a palace called Whitehall, built before the middle of the 13th century. In 1530 it became the residence of the court, but in 1695 was destroyed by fire, excepting the Banqueting Hall, added by James I., from a design of Inigo Jones, in 1619. Charles I was executed in front of Whitehall and Cromwell died there.

WHITE HOUSE, the official residence of the president of the United States, in Washington, is a two-story white free-stone edifice, painted white, 170 by 86 feet. It contains the private apartments of the president on the second floor and reception rooms on the first floor. Among the latter are the famous East room, 80 by 40 feet, used for public receptions; the Blue room, used for diplomatic and social functions; and the Red and Green rooms. The original executive mansion was begun in 1792 and first occupied by President Adams in 1800. It was burned by the British in 1814, and rebuilt in 1818. The White House is surrounded by an attractive park, in which during the summer music is provided by the Marine band.

WHITE LEAD. See Ceruse.

WHITE MOUNTAINS, a group in the northeast of the United States, in New Hampshire, belonging to the Alleghanies. They have fine scenery and

are a favorite summer resort. The culminating point is Mount Washington, 6288 feet.

WHITE-OAK, a species of oak, a native of the United States of America and of parts of Canada.

WHITE-PINE, one of the most valuable and interesting species of pines, common to Canada and the northern parts of the United States. See Pine.

WHITE RIVER, (1) a river of Arkansas, with a course of 800 miles. It joins the Mississippi above the influx of the Arkansas river, and has several important affluents. Together with its tributaries it affords 500 miles of boat navigation. (2) A river in Indiana, formed by the confluence of the East and West Forks, emptying into the Wabash near Mount Carmel.

WHITE SEA, a large gulf of the Arctic ocean, penetrating into Northern Russia to the distance of between 300 and 400 miles. It has an area of about 47,000 sq. miles, with a coast-line of 1000 miles. It is navigable only from the middle of May to the end of September, being frozen over the rest of the year. Two canals, uniting the Dwina with the Volga and the Dnieper, connect the White sea with the Caspian and Black sea.

WHITE VITRIOL, sulphate of zinc. See Zinc.

WHITEWASH, a composition of lime and water, or of whiting, size, and water, used for whitening walls, ceilings, etc.

WHITING, a well-known fish belonging to the cod tribe. It abounds on all the British coasts, and in the seas of Northern Europe generally, and exceeds all the other fishes of its tribe in its delicacy and lightness as an article of food. It does not usually exceed 1½ lbs. in weight.

WHITING, a name for chalk, cleared of its grosser impurities, and employed as a whitewash and as a polishing powder for brass, silver, etc.

WHITLOW, in surgery, is an inflammation affecting the skin, tendons, or one or more of the bones of the fingers, and generally terminating in an abscess. There is a similar disorder which attacks the toes. Whitlows differ very much in their degree of violence and in their depth and extent. The usual exciting causes of whitlows are various external injuries, as pricks, contusions, etc. The lodgment of a thorn or splinter in the part is another frequent cause. They are much more common in young, healthy persons than in others, and in many cases occur without any assignable cause.

WHITMAN, Marcus, American pioneer, was born at Rushville, N. Y., in 1802. In 1836 with three other missionaries, he started westward. The party took the first wagon across the Rocky mountains, reached the Columbia river on May 21st, and located near the site of the present Walla Walla, Wash. On November 29, 1847, the Cayuse Indians attacked the station, murdered Whitman, his wife, and twelve other persons, and took the other residents prisoners. It has been claimed that Whitman's visit to the East in 1842-3 prevented the cession to England of the American claim to Oregon.

WHITMAN, Walt, an American poet born in Long Island, in the state of New York, in 1819. In his early days he worked at the carpentry trade and at printing. Subsequently he became a school teacher, and wrote for the press. During the civil war Whitman devoted himself to the care of the wounded in the hospitals of Virginia and Washington, and at the end of the war came out with his constitution irretrievably broken. He subsequently entered the government service in the capital, remaining there till 1874. He then removed to Camden, N. J., where he died in 1892. In 1887 his English admirers raised a subscription in his behalf. His poems are like nothing else in the language, rough, rude, chaotic even, but strongly individual. The best known are: *Leaves of Grass*, *Drum Taps*, and *Democratic Vistas*. *Specimen Days and Collect*, and *November Boughs*, contain his prose writings, old and new; though it is difficult in the case of Whitman to distinguish prose from poetry in the ordinary senses of the terms.

WHITNEY, Eli, American inventor, born at Westborough, Mass., in 1765, and educated at Yale college, where he graduated in 1792. Going then to Georgia as a teacher, he there invented a machine for separating the cotton from the seed. Returning to the north he started business in conjunction with a man named Miller as a manufacturer of cotton gins. But the profits of the business, together with 50,000 dollars voted to him by the state of South Carolina, were swallowed up in his lawsuits in defense of his rights. He subsequently went into the manufacture of firearms, for which he received a government contract, and so made a fortune. He died in 1825.

WHITNEY, Josiah Dwight, American geologist, was born at Northampton, Mass., in 1819. Through his studies in the mining regions of the United States he became the foremost authority of his day on economic geology. The best known of his writings are *The Mineral Wealth of the United States*, *The Geological Survey of California*, *Reports on the Geology of the Lake Superior Land Region* and of Ohio. He died in 1896.

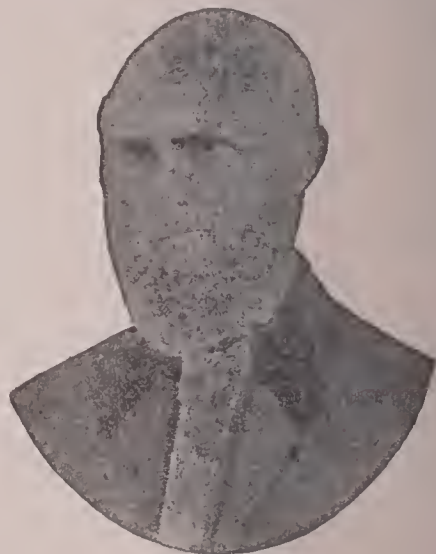
WHITNEY, William Collins, American politician, was born at Conway, Mass., in 1841. From 1875 to 1882 he was corporation counsel to New York. He was active in the state campaign of 1882 which resulted in the election of Grover Cleveland as governor. He was appointed by President Cleveland in 1885 secretary of the navy. In 1892 he successfully managed the Cleveland presidential campaign. He died in 1904.

WHITNEY, William Dwight, a distinguished American philologist, born in 1827 at Northampton, Mass., studied at Williams' college, Williamstown, and at Yale college, giving special attention to Sanskrit. He also studied Sanskrit in Germany from 1850 to 1853, returning in the latter year to America. The first-fruits of his studies in Sanskrit was an edition of the *Atharva-Veda*. He had previously been made professor of Sanskrit and of comparative philology at Yale college. Among his independent works may be mentioned, *Language and*

the *Study of Language*, *Oriental and Linguistic Studies*, *Life and Growth of Language*, *Sanskrit Grammar*, *German Grammar*, etc. He was chief editor of the *Century Dictionary*. He died in 1894.

WHITSUNTIDE. See Pentecost.

WHITTIER, John Greenleaf, American poet, was born of Quaker parents in 1807 at Haverhill, Mass., and educated at the academy of his native place. In his younger days he worked on his father's farm and learned the shoe-making trade, but early began to write for the press, and in 1831 published his first work, *Legends of New England*, in prose and verse. He carried on the farm himself for five years, and in 1835-36 he was a member of the legislature of



John G. Whittier

Massachusetts. After having edited several other papers he went to Philadelphia to edit the *Pennsylvania Freeman*, an anti-slavery paper, the office of which was burned by the mob in 1839. In the following year he returned to his native state, settling at Amesbury, where (or at Danvers, Mass.) he afterward chiefly resided. Among the numerous volumes of poetry which he from time to time gave to the world the following may be mentioned: *Moll Pitcher*, *Lays of My Home*, *Miscellaneous Poems*, *The Voices of Freedom*, *Songs of Labor*, *The Chapel of the Hermits*, *Home Ballads and Poems*, *Snow Bound*, *In War-time*, *National Lyrics*, *Ballads of New England*, *Miriam*, *Mabel Martin*, *Hazel Blossoms*, *The King's Missive*, *Poems of Nature*, *St. Gregory's Guest*, etc. Whittier's poems are distinguished by their freshness, their quiet power, and intense feeling. He died in 1892.

WHOOPIING-COUGH. See Hooping-cough.

WHORL, in botany, a ring of organs all on the same plane.

WHORTLEBERRY, a genus of shrubby plants, with alternate leaves, pink or red bell-like flowers, and berries of a dark purple, bluish, or red color. The common whortleberry, bilberry, or blaeberry is a hardy plant, which grows in forests, heaths, and on elevated moun-

tains. Whortleberries in North America are generally known as huckleberries.

WICH'ITA, a city in Kansas, situated on the east bank of the Arkansas river. It is the most important railway center in the state, being the junction of seven different lines. Wichita has sprung into existence since 1870. Pop. 30,000.

WICKLIFFE, Wycliffe, etc., John, was born about 1320 at Hipswell, near Richmond, in Yorkshire. He was educated at Oxford; was elected master of Balliol college, and in 1361 was appointed rector of Fylingham, or Fillingham, in Lincolnshire. He afterward became doctor of theology and teacher of divinity in the university; and for some time held the living of Ludgershall, in Buckinghamshire. Disputes existed at this period between Edward III. and the papal court relative to the homage and tribute exacted from King John, and the English parliament had resolved to support the sovereign in his refusal to submit to the vassage. Wickliffe came forward on behalf of the patriotic view and wrote several tracts, which procured him the patronage of John of Gaunt, duke of Lancaster. In some of his utterances he is said to have styled the pope Antichrist, charging him with simony, covetousness, ambition, and tyranny. His opinions began to spread,



John Wickliffe.

and the church grew alarmed. In May following the pope addressed three bulls to the king, the primate, and the University of Oxford, commanding them to take proceedings against Wickliffe, who in answer to the prelate's summons appeared in the chapel of Lambeth. Proceedings were, however, stopped by order of the queen-mother, and Wickliffe was dismissed with simply an injunction to refrain from preaching the obnoxious doctrines. In 1381 he publicly challenged the doctrine of transubstantiation, and his heresies were condemned by the theologians of Oxford, as well as by a provincial council called by Archbishop Courtenay and held at the Blackfriars, London, in 1382. Wickliffe was proclaimed a heretic, his works were condemned to be burned, and some of his followers were imprisoned; but he was allowed to retire unmolested to his rectory of Lutterworth. A stroke of paralysis terminated his life on the 31st of December, 1384. About thirty years after his death his doctrines were condemned by the Coun-

cil of Constance, and in 1428 his remains were dug up, burned, and the ashes cast into the Swift. The influence of his doctrines spread widely on the continent, and may easily be traced in the history of the Reformation. Wickliffe was the author of an enormous number of writings in Latin and English, and he ranks undoubtedly as the father of English prose. Many of his writings still remain in MS., and it was not until 1850 that the whole of his Bible appeared.

WICKLOW, a maritime county of Ireland, in the province of Leinster, bounded by the county of Dublin, St. George's channel, Wexford, Carlow, and Kildare; greatest length, 40 miles; breadth, 33 miles; area, 500,178. Its chief towns are Bray, Arklow, Wicklow, and Baltinglass. Pop. 60,679.

WIDGEON, or **WIGEON**, a species of natatorial bird allied to the Anatidæ or ducks. The American widgeon is most abundant in Carolina, and is often called bald-pate, from the white on the top of the head.

WIESBADEN (vēs'bā-dēn), a town in Prussia, province of Hesse-Nassau, finely situated at the foot of Mt. Taunus, in the valley of the Salzbach, about 2 miles from the Rhine. It is noted for its hot medicinal saline springs (the temperature of the Kochbrunnen being 156° F.), and it attracts annually upward of 60,000 visitors. The chief buildings are the Kursaal, a new town-house, an old and a new palace, library, museum, English church, and other churches, theater, etc. Pop. 86,086.

WIFE. See Husband and Wife.

WIG, an artificial covering of hair for the head, used generally to conceal baldness, but formerly worn as a fashionable means of decoration. Formally curled wigs are still worn professionally by judges and lawyers in Great Britain, and wigs are commonly used in making up for the stage.

WIG'AN, a municipal, parl., and county borough, Lancashire, England, on the Douglas, 21 miles northeast of Liverpool. Wigan stands in the center of an extensive coal-field, and its manufactures consist chiefly of calicoes, fustians, and other cotton goods, linens, checks, cotton twist, etc., besides iron-foundries, iron-forges, iron-rolling mills, chemical works, and corn and paper mills. Pop. 60,770.

WIGFALL, Lewis T., American lawyer and soldier, was born in South Carolina in 1816. He was a member of the Texas state legislature, at intervals, from 1849 to 1860, and was during the latter year elected United States senator. He entered the confederate army as an aide-de-camp to Gen. P. G. T. Beauregard, and received the surrender of Fort Sumter from Major Anderson in person. He was promoted to be brigadier-general, and subsequently represented Texas in the confederate congress. After the war he visited Europe, and in 1873 resumed the practice of law at Baltimore. He died in 1874.

WIGGIN, Kate Douglas, American, author, was born in Philadelphia, Pa., in 1857. Among her published stories are: *The Story of Patsy*, *A Cathedral Courtship*, *Penelope's Progress*, *Penel-*

ope's Experience in Ireland, *Diary of a Goose Girl*, *The Birds' Christmas Carol*.

WIGHT, Isle of, an island off the south coast of England, in the county of Hants, separated from the mainland by Spithead and the Solent; 23 miles in length, 13 miles broad; area, 93,341 acres. The main slope of the island is to the north, as is shown by the course of its chief streams, the Medina, Yar, and Eastern Yar. The chief towns are Newport (the capital), Ryde, Cowes, Ventnor, Bembridge, Freshwater, Yarmouth and the fashionable health-resorts of Sandown and Shanklin. Near Cowes is Osborne House, a favorite residence of the late Queen Victoria. Carisbrooke castle is an interesting ruin. Pop. 82,387.

WILCOX, Ella (Wheeler), an American journalist and poet, was born in 1855. She was at an early age a frequent contributor to journals. Among her collections of verse may be named: *Maurine*, *Poems of Passion and Poems of Pleasure*. An *Erring Woman's Love*. Among her prose writings are: *Mal Moulée*, a novel; *Men, Women, and Emotions*; *A Double Life*, *Sweet Dangers*. She also published a children's book, *The Beautiful Land of Nod*. Her books of poems are very popular and enjoy a very large sale.

WIGWAM, an Indian cabin or hut, so called in North America. These huts are generally of a conical shape, formed of



Wigwams of North American Indians.

bark or mats laid over stakes planted in the ground and converging at top, where is an opening for the escape of the smoke.

WILBERFORCE, William, English philanthropist, born at Hull 1759, died 1833. After completing his education at St. John's college, Cambridge, he was, in 1780, elected member of parliament for his native town; and in 1784 he was returned by the county of York. In 1791 he moved for leave to bring in a bill to prevent further importation of African negroes into the British colonies. Year after year he pressed this measure, but was always defeated till 1807, when it was passed during the short administration of Fox. He then devoted his energies to bring about the total abolition of slavery, and three days before his death he was informed that the House of Commons had passed a bill which extinguished slavery in the British colonies.

WILD-DUCK. See Duck.

WILDE, Oscar, Irish poet, born at Dublin in 1856. He studied first at Trinity college, Dublin, and finally at Magdalen college, Oxford, graduating at the latter institution in 1878. About

this time he affected to have become an apostle of æstheticism, and was an object of considerable interest by reason of his dress and manners. He visited Greece in 1879, and in 1881 lectured in the United States. From 1893 to 1895 he won considerable success as a writer of comedies remarkable for their sparkling epigrammatic cleverness—*Lady Windermere's Fan* and *The Importance of Being Earnest* among them; also *Salome*, a drama in the mediæval style. The most widely read of his books was *The Picture of Dorian Gray*, a novel. The end of his life was sad. Convicted in 1895 of a grave offense against morality, he was imprisoned for two years, during which he wrote one of his strongest poems, *A Ballad of Reading Gaol*. After his release he went to Paris, where he arranged for the publication of his greatest work, *De Profundis*. He died November 30, 1900.

WILKES, Charles, American naval officer, born in New York City April 3, 1798. He entered the United States navy in 1818, as midshipman, and was promoted lieutenant in 1826. At the outbreak of the rebellion he was engaged in the West India waters, searching for the confederate cruiser *Sumter*, when he encountered the British steamer *Trent*, engaged in conveying two confederate commissioners, Mason and Slidell, to England and France. He demanded the two officials, and bore them as prisoners of war to Boston harbor. His action nearly involved Great Britain and the United States in war. Wilkes was, however, promoted to be commodore. Later, and until the close of the war, he was attached to the West Indian squadron, and was retired July 25, 1866, with the rank of rear-admiral. He died in 1877.

WILKESBARRE (wilks'ba-re), capital of Luzerne county, Pennsylvania, on the north branch of the Susquehanna, about 100 miles northwest of Philadelphia. It is the center of a rich anthracite coal-field, and has manufactures of machinery, locomotives, cars, mining engines and tools, iron castings, ropes, brewery products, etc. Pop. 61,416.

WILKIE, Sir David, one of the most famous painters of the British school, was son of the minister of Culter, near Cupar, Fifeshire, born there 1783, died at sea off Gibraltar 1841, while returning from a visit to Palestine. He was elected an associate of the Academy in 1809, and in 1811 became an academicien. In 1825, owing to ill-health, he made an extended tour through Italy, Germany, and Spain. In the latter country his style as a painter underwent a marked change when he came under the influence of Velasquez and Murillo. Returning after three years to England, he was appointed (1830) painter in ordinary to the king, and was knighted in 1836. His pictures, such as the *Blind Fiddler*, *Rent Day*, *Cottars' Saturday Night*, *Blind Man's Buff*, *Chelsea Pensioners reading the Gazette of Waterloo*, *John Knox preaching before the Lords of the Congregation*, *The Entrance of George IV. into Holyrood*, *The Spanish Council of War*, *The Maid of Saragossa*, *Napoleon and Pius VII.*, and *The Queen's First Council*, are well known.

WILKINSBURG, a town in Allegheny co., Pa., on the Penn. railroad; 7 miles e. of Pittsburg. It is closely identified with the business interests of Pittsburg. Pop. 13,602.



Sir David Wilkie.

WILL, The, is usually described as one of the three faculties by means of which the human mind finds expression, the other two being thought (or intellect) and feeling (or emotion). It is the faculty by which a choice is made between two courses of action, as distinct from the exercise of this power, which is more fitly described as volition. This faculty of the will, in the maturity of its complex power, is usually conceived as having been educated by a process of sensation; pleasure and pain giving rise to the motives by which the active determining energy is set in motion. Yet the exact relation between will and motive, the question whether the motive governs the will or the will determines the motive, has never been authoritatively settled. Thus the "freedom" of the will has, until now, been maintained as a metaphysical and theological belief in opposition to the doctrine of "necessity." Aristotle in his *Ethics* incidentally asserted the freedom of the will; with this the Stoics and Epicureans agreed; as did also Justin Martyr, Origen, and St. Augustine; while its later adherents were Reid, Stewart, Kant, and Hamilton. On the contrary, among the early Christians, the Gnostics denied the freedom of the human will; so also did Spinoza; while the more modern advocates of the doctrine of "necessity" were Hobbes, Hume, Jonathan Edwards, and John S. Mill.

WILL, or **TESTAMENT**, in law, the legal declaration of a man's intentions as to what he wills to be performed after his death in relation to his property. In England, as also in the British colonies and the United States, no will, whether of real or personal estate, is to be valid unless it be in writing, and signed at the foot or end by the testator, or by some person in his presence, and by his direction. Such signature must be made and the document acknowledged as his will by the testator in the presence of two or more witnesses present at the same time, and such witnesses must attest and subscribe the will in the presence of the testator. Any alteration or obliteration must also be duly signed by the testator and the witnesses. A will may be revoked by cancelling or obliteration, tearing, or burning; or by

a new will expressly revoking the former, or containing provisions inconsistent with it.

WILLARD, Francis Elizabeth, American reformer, was born at Churchville, N. Y., in 1839. In 1874 she was corresponding secretary of the National Women's Christian Temperance Union, and later was president of the W. C. T. U. of Illinois; president of the N. W. C. T. U. 1879-97. She was one of the founders of the prohibition party; editor of the *Chicago Post* in 1879, and later of *The Union Signal*. In 1883 she organized the World's Women's Christian Temperance Union, and was made its president at the first convention at Boston, in 1891. Her works included *Women and Temperance*, *Nineteen Beautiful Years*, *Women in the Pulpit*, and *Glimpses of Fifty Years*. She died in 1898.

WILLET, a bird of the snipe family found in America. It is a fine game bird, and its flesh and eggs are prized for food. Called also stone curlew.

WILLIAM I., surnamed the Conqueror, King of England, and Duke of Normandy, born 1027, was the natural son of Robert, duke of Normandy, by Arlotta, the daughter of a tanner of Falaise. His father having no legitimate son, William became the heir at his death, and ruled Normandy with great vigor and ability. The opportunity of gaining a wider dominion presented itself on the death of his second cousin Edward the Confessor, king of England, whose crown he claimed. To enforce this claim he invaded England, and the victory of Hastings, in which his rival Harold was killed, ensured his success (1066). He established the administration of law and justice on a firm basis throughout England, conferred numerous grants of land on his own followers, and introduced the feudal constitution of Normandy in regard to tenure and services. He expelled numbers of the English church dignitaries and replaced them by Normans. Toward the end of his reign he instituted that general survey of the landed property of the kingdom, the record of which still exists under the title of *Domesday Book*. In 1087 he went to war with France, whose king had encouraged a rebellion of Norman nobles. He entered the French territory, and committed great ravages, but, by a fall from his horse at Mantes, received an injury which caused his death at the abbey of St. Gervais, near Rouen (1087).

WILLIAM II., surnamed Rufus, from his red hair, third son of the preceding, was born in Normandy in 1056, and crowned at Westminster in 1087 on the death of his father. A characteristic incident in William's reign was his contention with Anselm, archbishop of Canterbury, regarding church property and the sovereignty of the pope. In 1100 he met his death while hunting in the New Forest, by an arrow shot accidentally or otherwise from the bow of a French gentleman named Walter Tyrrel.

WILLIAM III., Stadtholder of Holland and King of England, son of William II. of Nassau, prince of Orange, and Henrietta Mary Stuart, daughter of

Charles I. of England, was born at the Hague on the 4th of November, 1650. During his early life all power was in the hands of the grand pensionary John De Witt, but when France and England in 1672 declared war against the Netherlands, there was a popular revolt, in which Cornelius and John De Witt were murdered, while William was declared captain-general, grand-admiral, and stadtholder of the United Provinces. In the campaign which followed he opened the sluices in the dykes and inundated the country round Amsterdam, thus causing the French to retire, while peace was soon made with England. In 1677 he was married, and the Peace of Nijmegen followed in 1678. As his wife was heir presumptive to the English throne he had kept close watch upon the policy of his father-in-law James II., and in 1688 he issued a declaration recapitulating the unconstitutional acts of the English king, and prom-



William III.

ising to secure a free parliament to the people. Being invited over to England by some of the leading men he arrived suddenly at Torbay, November 5, 1688, with a fleet of 500 sail, and with 14,000 troops. Upon landing a great part of the nobility declared in his favor, and in December James fled with his family to France, after which William made his entry into London. The throne was now declared vacant, the Declaration of Rights was passed, and on February 13, 1689, Mary was proclaimed queen and William king. Scotland soon afterward followed England's example (with a partial resistance under Dundee); but in Ireland, whither Louis XIV. sent James with an army, the majority of the Catholics maintained the cause of the deposed king, until they were defeated at the Boyne (1690) and at Aughrim (1691). In the war with France William was less successful; but although he was defeated at Steinkirk (1692) and Neerwinden (1693) Louis was finally compelled to acknowledge him king of England at the Peace of Ryswick in 1697. In 1701 James II. died, and Louis XIV. acknowledged his son as king of England. England, Holland, and the empire had already combined against Louis, and the war of the Spanish succession was just on the point of commencing when William died, 8th March, 1702, from the effects of a fall from his

horse, his wife having already died childless in 1694.

WILLIAM IV., King of Great Britain and Ireland, and third son of George III., born 1765, died 1837. He served in the navy, rising successively to all the grades of naval command, till in 1801 he was made admiral of the fleet. In 1789 he had received the title of Duke of Clarence, and in June, 1830, he succeeded his brother George IV. to the throne.

WILLIAM I., first German emperor, and seventh king of Prussia, second son of Frederick William III., born 22d March, 1797, died 9th March, 1888. At an early age he began the study of military affairs; took part in the campaign of 1813-14 under Blücher; married in 1829 Princess Augusta of Saxe-Weimar; became heir-presumptive to the throne of Prussia on his father's death in 1840; was commander of the forces which suppressed the revolutionary movement (1849) in Baden; created regent in 1858, and on the death of the king, his brother, in 1861 he succeeded to the throne of Prussia. During his reign Prussia defeated Denmark (1846), annexing the duchies of Schleswig-Holstein; quarreled with Austria, and engaged in a campaign which ended in the victory of Sadowa (1866); and went with the rest of Germany to war with France in 1870 (see Germany and France). In this war the operations of the Prussian generals were under the personal supervision of the king. It was at Versailles, during the siege of Paris (January 18, 1871) that he was proclaimed German emperor.

WILLIAM II., King of Prussia and German emperor, eldest son of Frederick III. and Victoria, princess royal of England, was born January 27, 1859; educated at Cassel and Bonn, married Augusta Victoria of Schleswig-Holstein-Augustenburg in 1881, and succeeded his father, 15th June, 1888. Since his accession he has shown a great deal of energy in various directions, such as in military affairs and social questions, and his independent spirit brought about the retreat of Bismarck in 1890.

WILLIAM AND MARY COLLEGE, the second oldest college in the United States, was founded in 1693. The institution received a penny a pound on exports of tobacco and various other privileges, including the profits from the office of surveyor-general of Virginia. The college attained rapid prosperity, but it suffered heavily in the revolution. During the civil war it was occupied by the federal troops and much of its property was destroyed. In 1893 congress granted an indemnity of \$64,000 for its losses. The college offers two courses—the collegiate, leading to the degrees of B.A. and M.A., and the normal. The college has a distinguished list of graduates, among them Presidents Jefferson, Monroe, Tyler, and Harrison, Chief Justice John Marshall, and Gen. Winfield Scott. The Phi Beta Kappa fraternity was established at William and Mary in 1776.

WILLIAM THE LION. See Scotland (History).

WILLIAM THE SILENT, Count of Nassau and Prince of Orange, eldest son

of William, count of Nassau, was born in 1533. It was by his political prudence that the five northern provinces joined in the Union of Utrecht (1579), and thus laid the foundations of the republic of the United Netherlands. To check this growing power Philip set a price of 25,000 gold crowns upon the head of the prince, with the result that his life was attempted in 1582 at Antwerp, and he was ultimately assassinated at Delft in 1584 by a fanatic named Balthasar Gerard.

WILLIAMS, Roger, a puritan divine and founder of the colony of Rhode Island, North America, was born of Welsh or Cornish parents about 1599, died 1684. He emigrated in 1631 to New England. Here he became pastor of a church at Salem, until his extreme views regarding the jurisdiction of the civil magistrate caused him to be banished from the colony of Massachusetts. Upon this he repaired with a few companions to Rhode Island and founded a settlement, which he called Providence. He was twice in England in connection with a charter for the colony, and there made the acquaintance of Milton and other prominent puritans. He also published *A Key into the Language of the Indians of America*, *The Bloody Tenent of Persecution for the Cause of Conscience*, *The Bloody Tenent yet more Bloody*, and *George Foxe digged out of his Burrowes*.

WILLIAMSPORT, a town in Lycoming county, Pennsylvania, on the west branch of the Susquehanna. It is a favorite summer residence, and the center of a large lumber trade. Pop. 39,161.

WILLIMAN'TIC, a town in Windham county, Connecticut, an important railroad and industrial center. Pop. 10,415.

WILLIS, Nathaniel Parker, an American author, born at Portland, Maine, 1807; died 1867. His numerous published writings include: *Pencilings by the Way*, *Inklings of Adventure*, *Loiterings of Travel*, *People I have Met*, *Famous Persons and Places*, *Outdoors at Idlewild*, *The Convalescent*, his *Rambles and Adventures*.

WILLOW, the common name of different species of plants. The species of willows are numerous, about 160 having been described. They are all either trees or bushes, and grow naturally in a moist soil. On account of the flexible nature of their shoots, and the toughness of their woody fiber, willows have always been used as materials for baskets, hoops, crates, etc. The wood is soft, and is used for wooden shoes, pegs, and the like; it is also much employed in the manufacture of charcoal, and the bark of all the species contains the tanning principle. The weeping willow is a native of China, and is a fine ornamental tree. The willow has for long been considered as symbolical of mourning.

WILLOW-WREN, one of the most abundant of the warblers, with a pleasing song. The general color is dull, olive-green above, the chin, throat, and breast yellowish-white, and the belly pure white.

WILMINGTON, a city in Delaware, 28 miles southwest of Philadelphia, near the Delaware between Brandywine and Christiana creeks. It is regularly built,

and has a university, a city-hall, an opera-house, an hospital, cotton and woolen factories, iron-foundries, rolling-mills, potteries, tanneries, breweries, and an extensive trade. Pop. 91,510.

WILMINGTON, a port in North Carolina, on the Cape Fear river, 160 miles n.e. of Charleston. It is the largest town in the state, has turpentine dis-

quently published by Lucien Buona-parté. A bronze statue of Wilson by Mossman has been erected in Paisley.

WILSON, Francis, American actor, was born in Philadelphia in 1854. He began his career in a minstrel show. In 1879 he appeared in M'liss with Annie Pixley. After several years in regular comedy, he took up comic opera. In 1889, he made his appearance as a star in *The Oolah*. Among his later pieces have been: *The Lion Tamer*, *The Devil's Deputy*, *The Little Corporal*, and *The Toreador*.

WILSON, Henry, statesman, was born in Farmington, N. H., in 1812. In 1840, as the "Natick cobbler," he addressed political meetings, in that year being elected to the Massachusetts legislature. In 1855 he was chosen United States senator. His speeches bear the impress of clear-sighted statesmanship. Mr. Wilson was an ardent antislavery man. In 1872 he was elected vice-president. He died in 1875.

WILSON, James, American cabinet officer, was born in Ayrshire, Scotland, in 1835. He came with his parents to the United States in 1852. He was a member of the Iowa state assembly for three terms. From 1873 to '77 and from 1883 to '85 he was a member of congress. In 1870-74 he was regent of the State University of Iowa, and from 1890-97 he was a director of the agricultural experiment station. In 1897 he became secretary of agriculture in McKinley's cabinet and was reappointed in 1904 by President Roosevelt.

WILSON, John, better known in literature as "Christopher North," was born in Paisley 1785, died 1854. He formed an acquaintance with Wordsworth, Southey, and Coleridge; contributed to Coleridge's *Friend*, and published a poem called *The Isle of Palms* (1812). Another poem, *The City of the Plague*, appeared in 1816. Besides his numerous magazine articles, the most characteristic of which were some of the *Noctes Ambrosianæ* and those published subsequently as the *Recreations of Christopher North*, he wrote three tales: *The Lights and Shadows of Scottish Life*, *The Trials of Margaret Lindsay*, *The Foresters*, and *An Essay on the Genius and Character of Burns*.

WILSON, Woodrow, American educator and historian, was born at Staunton, Va., in 1856. In 1883-85 he studied jurisprudence, history, and political science at the newly opened Johns Hopkins university, from which in 1885 he received the degree of Ph. D. In 1890 he became professor of jurisprudence and politics at Princeton. Upon the resignation of President Patton in June, 1902 Wilson was elected president of Princeton university by the unanimous vote of the trustees. In addition to Congressional Government and magazine articles and published addresses, his writings include: *The State: Elements of Historical and Practical Politics*; *An Old Master*, and *Other Political Essays*; *Division and Reunion, 1829-1889*; *George Washington*; and *A History of the American People*.

WILTS, or **WILTSHIRE**, a southwestern county of England, bounded by the counties of Gloucester, Somerset,

Dorset, Hants, and Berks; area, 866,670 acres. Pop. 273,845.

WIMBLEDON, a town of England, county of Surrey, 7 miles southwest of London, at the northeast extremity of Wimbledon common. Up to 1889 it was well known in connection with the shooting competitions of the National Rifle association. Pop. 41,604.

WINCEY, a strong and durable cloth, plain or twilled, composed of a cotton warp and a wollen weft. Heavy winceys have been much worn as skirtings and petticoats.

WINCH, a kind of hoisting machine or windlass, in which an axis is turned by means of a crank-handle, and a rope or chain is thus wound round it so as to raise a weight.

WINCHELL, Alexander, American geologist, was born in North East, Dutchess county, N. Y., in 1824. In 1854 he became professor of physics and civil engineering in the University of Michigan, and in the following year was transferred to the chair of geology, zoölogy, and botany, which he held until 1873, filling a similar professorship in the University of Kentucky from 1866 until 1869. He was director of the geological survey of Michigan from 1859 until 1871, with an intermission during the war. He was subsequently professor of geology, zoölogy, and botany in both the Syracuse and Vanderbilt universities, but in 1878, owing to his belief in the existence of a preadamite race, and his defense of the doctrine of evolution, he was forced out of Vanderbilt by the abolition of his lectureship. In 1879 he accepted the chair of geology and paleontology in the University of Michigan. The degree of LL.D. was conferred on him by Wesleyan in 1867. His name has been assigned to fourteen new species. He died February 19, 1891.

WINCHELL, Newton, Horace American geologist, was born at North East, Dutchess co., N. Y., in 1839. In 1866 he became assistant state geologist. Three years later he was called to the chair of mineralogy and geology in Minnesota university, and at the same time accepted the position of state geologist. He was president of the Academy of Sciences of Minnesota, a member of the Assay Commission of the United States, and editor of the *American Geologist*.

WIND, a current in the atmosphere, as coming from a particular point. The principal cause of currents of air is the disturbance of the equilibrium of the atmosphere by the unequal distribution of heat. When one part of the earth's surface is more heated than another, the heat is communicated to the air above that part, in consequence of which the air expands, becomes lighter, and rises up, while colder air rushes in to supply its place, and thus produces wind. It is thus that the sea-breeze is produced every afternoon at places near the coast, especially in intertropical countries, the ground having been heated by the sun's rays to a higher temperature than the sea; while about twelve hours later, the reverse effect—a land-breeze—occurs, the ground having fallen at night to a lower temperature than the sea. As the heat of the sun is greatest in the



tilleries, machine-shops, etc., and exports large quantities of cotton and lumber. Pop. 22,056.

WILMOT, David, American political leader and jurist, was born in Bethany, Pa. He became prominent as a democratic politician, and from 1845 to 1851 was a member of the national house of representatives. Although a democrat he was opposed to the extension of slavery and in 1843 he moved his famous amendment, known as the Wilmot Proviso. He served in the United States senate 1861-63; and held the office of judge of the United States court of claims until his death in 1868.

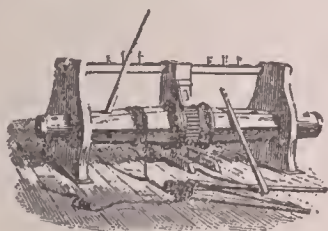
WILMOT PROVISIO, the war between Mexico and the United States terminated in the acquisition of a vast territory by the latter. Mr. Wilmot, of Pennsylvania, in 1846, offered in congress what became historic as the "Wilmot Proviso," that "no part of the territory thus acquired should be open to the introduction of slavery." This proviso brought heated discussion of the slave question, and civil war and a dissolution of the Union were threatened. The proviso failed of passage.

WILSON, Alexander, the American ornithologist, born at Paisley 1766, died at Philadelphia 1813. He emigrated to America in 1794, where he became a schoolmaster; assisted in editing the American edition of Rees's *Cyclopædia*; learned drawing, and ultimately determined to write and illustrate a work on American birds, being long interested in the subject of ornithology. The result of his labor was the *American Ornithology* (seven vols., 1808-13), a work which was left unfinished by Wilson, but was completed by his friend Ord, while a continuation was subse-

equatorial regions, the general tendency there is for the heavier columns of air to displace the lighter, and for the air at the earth's surface to move from the poles toward the equator. The only supply for the air thus constantly abstracted from the higher latitudes must be produced by a counter-current in the upper regions of the atmosphere, carrying back the air from the equator toward the poles. Besides the unequal distribution of heat already mentioned, there are various other causes which give rise to currents of air in the atmosphere, such as the condensation of the aqueous vapors which are constantly rising from the surfaces of rivers and seas, and the agency of electricity. Winds have been divided into fixed or constant, as the trade-winds; periodical, as the monsoons; and variable winds. (See Trade-winds, Monsoon.) There are also local winds, which receive particular names; as, the etesian wind, the sirocco, the simoom, the harmattan, the mistral, typhoon, etc. The velocity and force of the wind vary considerably, as shown by the anemometer. Thus a light wind traveling at the rate of 5 miles an hour exercises a pressure of 2 oz. on the square foot; a light breeze of 10 miles an hour has a pressure of 8 oz.; a good steady breeze of 20 miles, 2 lbs.; a storm of 60 miles, 18 lbs.; a violent hurricane of 100 miles, 50 lbs., a pressure which sweeps everything before it.

WIND-INSTRUMENT, an instrument of music, played by means of artificially produced currents of wind, as the organ, harmonium, etc., or by the human breath, as the flute, horn, etc. See Instrument and Instrumental Music.

WINDLASS, a modification of the wheel and axle used for raising weights. The simple form of the windlass used in ships, for raising the anchors, consists of a strong beam of wood placed horizontally, and supported at its ends by iron spindles, which turn in collars or bushes inserted in what are termed the

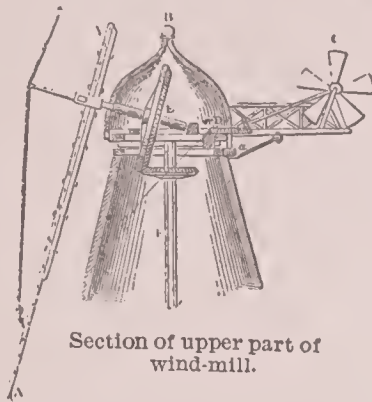


Ship's windlass.

windlass bitts. This large axle is pierced with holes directed toward its center, in which long levers or hand-spikes are inserted for turning it round when the anchor is to be weighed or any purchase is required. It is furnished with pawls to prevent it from turning backward when the pressure on the handspikes is intermitted.

WIND-MILL, a mill which receives its motion from the impact of wind upon sails, and which is used for grinding corn, pumping water, etc. In structure the wind-mill is a conical or pyramidal tower, and from the position of the sails in relation to the wind-shaft it is described as either vertical or horizontal. In the former, a section of which is here given, the wind is made to act upon sails

or vanes a a attached by means of rectangular frames to the axle or wind shaft of the mill. This axle is placed nearly horizontal, so that the sails by the pressure of the wind revolve in a nearly vertical plane, thus giving a rotatory motion to the driving wheel e fixed in the wind-shaft. The movement thus produced is transferred by means of bevel-wheels to the main shaft f, which is connected with the specific machinery of the mill. As the sails to be effective must always face the wind, this is accomplished in modern mills by a self-adjusting cap b, moved by a fan or flyer c attached to the projecting



Section of upper part of wind-mill.

framework at the back of the cap. By means of a pinion on its axis, motion is given to the inclined shaft and to the wheel d on the vertical spindle of the pinion a; this latter pinion engages the cogs on the outside of the fixed rim of the cap, and by these means the sails are kept constantly to the wind, when the wind causes the fan c to revolve. In the horizontal wind-mill, which is considered inferior to the other, the wind-shaft is vertical, so that the sails revolve in a horizontal plane. In most of the wind-mills used in America the sails consist of narrow boards arranged in a circular framework at a constant angle to catch the wind. The steam-engine has almost totally displaced wind-mills in Britain, but they are still largely used in Holland.

WINDOM, William, American statesman, was born at Waterford, Ohio, in 1829. He was educated in Ohio, studied law, and was admitted to the bar in 1850 at Mount Vernon. In 1855 he removed to Minnesota, and four years later he was elected to congress, serving in the lower house for ten years. He was elected United States senator in 1870, re-elected in 1871, and again in 1877, and in 1889 was made secretary of the treasury, which position he held until his death. He died in 1891.

WINDOW, an opening in the wall of a building to admit light and air into the interior. In dwelling-houses in ancient times the windows were narrow slits, and it was not until about the end of the 12th century that glass was used to any great extent in private houses in England. Windows, properly so-called, were almost unknown in the religious edifices of the Egyptians, Greeks, and Romans, the light being admitted at the roof, but they constitute an essential and distinguishing feature of the Gothic style. In modern houses windows are

made capable of being opened and shut by means of easements or sashes. In Britain a window-tax was imposed in 1695, and in 1851, when the tax was abolished, each house having more than seven windows was taxed.

WINDPIPE. See Trachea.

WINDSOR, or **NEW WINDSOR**, a municipal and parliamentary borough of England, county of Berks, beautifully situated on the Thames, 22 miles w. from London. Pop. 21,477. Windsor owes its chief importance to its castle, which stands east of the town on a height overlooking the river Thames, and is the principal royal residence in the kingdom. It was begun, or at least enlarged, by Henry I., and has been altered and added to by almost every sovereign since. The castle stands in the Home Park or "Little Park," which is 4 miles in circumference, and this again is connected with the Great Park, which is 18 miles in circuit, and contains an avenue of trees 3 miles in length. The chief features of interest in the castle are the old state apartments; St. George's Chapel, where the Knights of the Garter are installed, and the vaults of which contain the remains of Henry VI., Edward IV., Henry VIII., Charles I., George III., George IV., and William IV.; the Round Tower or ancient keep; and the present state apartments. In the Home Park is Frogmore, with the mausoleum of the Prince Consort and Queen Victoria; and in the Great Park is a large artificial lake called Virginia Water.

WINDWARD ISLANDS, one of the divisions of the Lesser Antilles in the West Indies, so called in opposition to another division of the same, called the Leeward Islands. The term is vaguely used, but generally includes Martinique, St. Lucia, St. Vincent, Grenada, Barbadoes, and Tobago.

WINE is the term specifically applied to the fermented juice of the grape or fruit of the vine, though it may also be applied to the fermented juice of any fruit. (See Vine.) Wines are distinguished practically by their color, hardness or softness on the palate, their flavor, and their being still or effervescing. The differences in the quality of wines depend partly upon differences in the vines, but more on the differences of the soils in which they are planted, in the exposure of the vineyards, in the treatment of the grapes, and the mode of manufacturing the wines. When the grapes are fully ripe, they generally yield the most perfect wine as to strength and flavor. The juice is expressed from the grapes by means of presses of all varieties of construction, from the simple lever and wedge press to the machine with hydraulic power. It is usual to separate the juice as it is expressed into first, second, and third "runs," the first pressing being the best quality, and the amount of all the juice is usually about 70 per cent of the weight of the grapes. The juice of the grape when newly expressed, and before it has begun to ferment, is of a sweet taste, and is called must. The fermenting process requires much time and attention, and if it be arrested while part of the sugar is unchanged a fruity wine is the result. If

WINE-MEASURE

the process, however, is completed, and all the sugar converted into alcohol, a dry wine is obtained. When an effervescing wine, like champagne, is desired the fermenting liquid is bottled, and the process of fermentation completed in the bottle, where the carbonic acid gas remains to give it a sparkling effervescent quality. When the wine is red in color it shows that the skins of the grape have remained in the vat during fermentation, while in white wines the skins have been removed before that process is begun. The leading character of wine must be referred to the alcohol which it contains, and upon which its intoxicating powers principally depend. The amount of alcohol in the stronger ports and sherries is from 16 to 25 per cent; in hock, claret, and other light wines from 7 to 12 per cent. Wine containing more than 13 per cent of alcohol may be assumed to be fortified with brandy or other spirit. The most celebrated ancient wines were those of Lesbos and Chios among the Greeks, and the Falernian and Cecuban among the Romans. The principal modern wines are Port, Sherry, Claret, Champagne, Madeira, Hock, Marsala, etc. The varieties of wine produced are almost endless, and differ in every constituent according to the locality, season, and age. The principal wine-producing countries are France, Germany, Spain, Portugal, Italy, Sicily, Greece, Cape Colony, Australia, and the United States.

WINE-MEASURE, an old English measure by which wines and other spirits were sold. In this measure the gallon contained 231 cubic inches, and was to the imperial standard gallon as 5 to 6 nearly.

WINGED BULL, an architectural decoration of frequent occurrence in ancient Assyrian temples, where winged



Assyrian winged human-headed bull.

human-headed bulls and lions of colossal size usually guarded the portals. They were evidently typical of the union of the greatest intellectual and physical powers.

WINGED LION, the symbol of the evangelist St. Mark, which was adopted as the heraldic device of the Venetian Republic. A celebrated bronze figure of the winged lion of St. Mark surmounting a magnificent red granite column, formed out of a single block, stands in the Piazzetta of St. Mark at Venice.

WINNIPEG, capital of the province of Manitoba, Canada, at the confluence of the Red river and Assiniboine, 40 miles s. of Lake Winnipeg. In 1870 this city was only a village, its sudden expansion

being due in great measure to its central position on the Canadian Pacific railway. It is connected by railway with the United States, and several other lines radiate from it. It has a city-hall, parliament-house, governor's residence, court-house, university (well endowed and having four colleges affiliated to it), and is well supplied with water, gas, and electricity. On the west side of the Red river is the suburb of St. Boniface. Pop. 42,340.

WINONA, a city in Minnesota, beautifully situated on the west bank of the Mississippi. It is a flourishing place and an important center of trade and manufactures. Pop. 21,416.

WINSTON, the county-seat of Forsyth county, N. C., 30 miles west of Greenboro; on the Southern and the Norfolk and Western railroads. It is adjacent to Salem, the two forming practically one community, known as Winston-Salem. Pop. Winston, 11,160; Salem, 3,946.

WINTER, the coldest season of the year, in the northern hemisphere comprising the months of December, January, and February. The astronomical winter begins on the shortest day (December 22) and ends with the vernal equinox (March 21).

WINTERGREEN, a name of several plants, one of them being the partridgeberry. The name is also given to a genus of perennial plants having short stems, broad evergreen leaves, and usually racemose white or pink flowers. It possesses astringent properties and was formerly used in medicine.

WINTER-MOTH, a moth, the larvæ of which are exceedingly injurious to apple, pear, cherry, and plum trees. The moths appear in their perfect state in the beginning of winter.

WINTER'S-BARK, a plant of South America. It is an evergreen shrub, the bark of which has an agreeable, pungent, aromatic taste, and tonic properties.

WINTER SOLSTICE. See Solstice.

WIRE, any metallic substance drawn to an even thread or slender rod of uniform diameter by being passed between grooved rollers or drawn through holes in a plate of steel, etc. Wire is usually cylindrical, but it is also made in various other forms. The metals most commonly drawn into wire are gold, silver, copper, and iron; but the finest wire is made from platinum. Wire-drawing is the name for the process of making wire. The metal to be drawn is first hammered into a bar, and then passed successively through a series of holes in a hardened steel plate, successively diminishing in diameter. Extremely fine gold and platinum wires for the spider-lines of telescope micrometers are made, some of these having a diameter of only $\frac{1}{1000}$ of an inch. The applications of wire are very numerous and interesting. Ropes of wire are extensively used for winding purposes in mines, and generally for all similar purposes. They are much used for the standing rigging of ships, for telegraph purposes, etc. The conducting part of submarine telegraph cables is simply a wire-rope of copper wires, with an outside protection of iron wires (See Rope). Wire-gauze for blinds, etc., is woven in the same manner as

WIRELESS TELEGRAPHY

ordinary textile fabrics. Fences, book-sewing, strings for musical instruments, pins and needles, etc., are among the innumerable modern uses to which wire is adapted.

WIRELESS TELEGRAPHY. The first practical working apparatus for the transmission of telegraphic messages without the use of wires was constructed by Guglielmo Marconi, an Ital-



Sig. Marconi.

ian electrical scientist. Its first public exhibition was at Toynbee hall, in London, on December 12, 1896. The first transmitter, then exhibited, was capable of sending a message for a distance of scarcely one mile. Since that date the science of wireless telegraphy has made such wonderfully rapid strides that messages are sent across the Atlantic ocean, and the system is a part of the commercial and industrial development of every civilized nation.

There are many wireless telegraph systems in use by the governments of the world. To Guglielmo Marconi belongs the honor of demonstrating the practicability of the science and its adaptation to the needs of the peoples.

The scientific principle which has enabled Marconi and his compeers to send telegraphic messages through space without the use of wires was known for a number of years before it was applied to practical use. In 1842 Professor Morse sent signals across the Susquehanna river without metallic connections of any sort by means of wires stretched along the banks. Science knew, for instance, that electricity, like heat, could be transmitted from one place to another by two entirely different processes. To illustrate: If one end of a wire be placed in a bed of live coals the other end soon becomes too hot to be held in the hand. The heat waves are carried along the wire, the wire itself serving as a conductor. But if the uncovered hand be placed a foot away from the live coals the heat, as in the case of the wire, soon becomes unbearable. The waves of heat are transmitted with only the air as a conductor. Now, for a bed of live coals, substitute a device for the generation of electricity. If the electricity is loosed upon a wire, the wire acts as a conductor and transmits the electric current to any required distance. It

WIRELESS STATION
CAPE BRETON NOVA SCOTIA

OCEAN

ATLANTIC

SLYNE HEAD

MANNIN BAY

CONNEMARA

Bog Land

CLIFDEN

Light Railway to Road

NETWORK of
Receiving &
Transmitting
Wires
on 8 Pillars

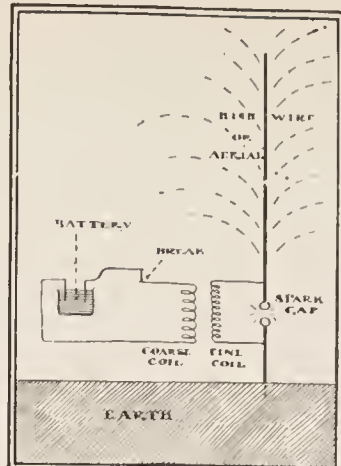
Receiving &
Transmitting
Room

INSTRUMENT
ROOM

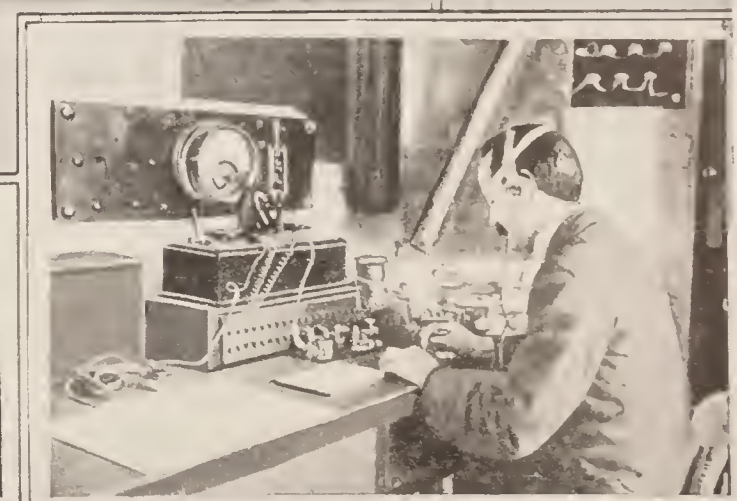
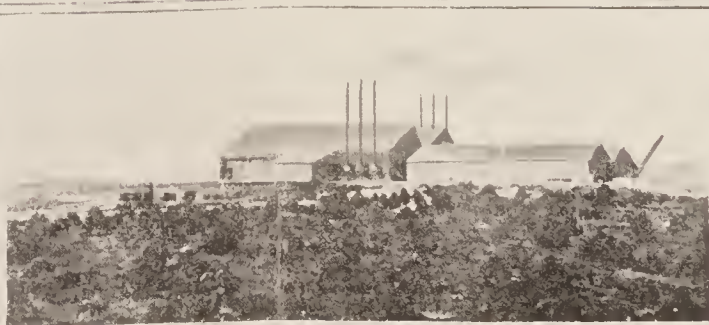
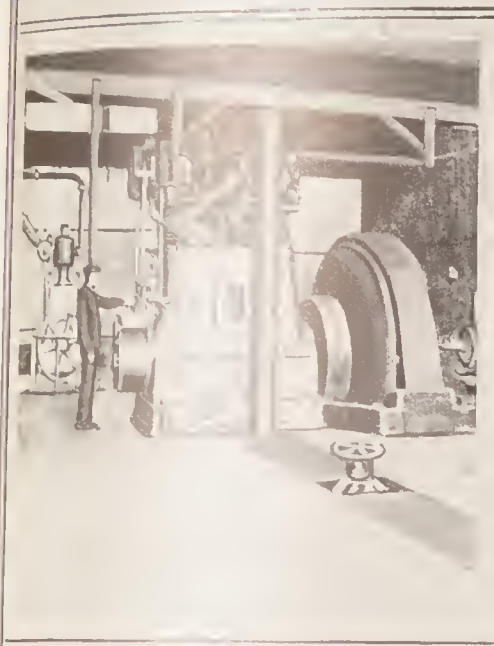
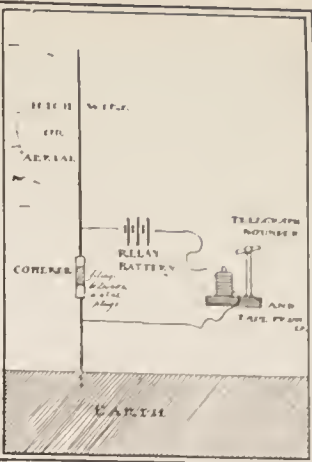
Engineers
Quarters

DYNAMO HOUSE
for supplying
Current to
Instrument
House

HOW
THE
MESSEGES
ARE
SENT



HOW
THE
MESSEGES
ARE
RECEIVED



HOW THE WIRELESS TELEGRAPH WORKS,

In this group of pictures is strikingly exhibited the actual operation of the latest wireless telegraph together with an explanation of the principles which make this marvel a possibility. The largest picture shows the Marconi Station and its surroundings in Ireland, which are fully explained in the picture itself. Note especially, however, the enormous network of receiving and transmitting wires supported on eight pillars and covering an area of 3,000 square feet. The method of operation of the telegraph is shown by the two small diagrams in the upper right hand corner. The first of these exhibits, in diagrammatic form, the mechanism for sending messages from a Marconi station. The battery or electrical power source is connected with a coil of coarse wire forming what is called the primary circuit. At a point in this circuit is a little lever for breaking the current into long and short Morse code signals. When the current flowing round and round in the primary circuit is broken by the lever, an electrical disturbance is set up in the coil of fine wire which surrounds the coarse coil. The tension set up in this secondary circuit causes an electric spark to span between the two brass plates at the spark gap. Electrical oscillations surge up and down the high "aerial" and down into the earth. The electrical surgings transfer themselves to the ether as waves which rush outward with terrific speed in every direction. At the extreme right is shown the method of receiving the messages. The waves which fly from the transmitting station almost leap to reach the distant receiving wire. (The same wire is used to transmit

and receive; the cable end being shifted from one instrument to the other.) The waves are then feeble and could not reach to an instrument, so that a "coherer" and "relay" have to be used. The coherer consists of metal filings which remain separate from one another and offer resistance to a current until the electric waves strike the aerial. The filings press together and the obstruction is bridged. The relay current can then act and then the current instantly flows through the circuit and operates the instrument which prints the code on paper tape. The ether waves do the work of a human engineer of a locomotive, the pulling of a lever by whom is sufficient to set the steam to work; but in this case, the relay battery takes the place of steam. In the lower left hand corner is a remarkable photograph of the wonderful pyrotechnics at Cape Breton or Conemara, which are visible to the camera but not to the naked eye. The photograph required an exposure of half an hour to fix the flashes on the plate. They give forth a sizzling sound like the frying of bacon. The straight bars of light on the plate appear to be star tracks left on the photographic plate.

At the extreme lower right hand corner is shown an operator. When he presses a key, a roaring crackle is heard in the instrument room, and the electrical oscillations are sent surging out on the wires and thence into the ether. The two smaller photographs show the interior and exterior of the engine houses, which are alike at both sides of the Atlantic Ocean.

is this principle which is adapted to the ordinary telegraph, telephone, or electric railway.

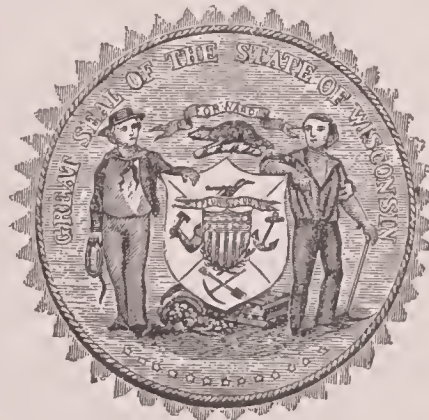
In 1886, however, Professor Hertz discovered that electricity could be made to radiate in the air, just as heat does. His discovery was the forerunner of the discovery of the possibility of wireless telegraphy. All that was necessary was to devise instruments for starting and stopping the electric waves, or, to be more exact, for making these waves longer or shorter, as might be desired, in order that the instrument which detected them could record them.

Marconi was not the first to devise these instruments, but he was the first to turn them to practical account. He only used, improved, and perfected the instruments devised by others. He was the first to send an intelligible wireless message in the Morse code; but several electrical scientists contributed to his success. Dr. Hertz, for instance, had discovered the principle of the electric waves. Dr. Edouard Branly devised the coherer—a glass tube filled with iron filings and attached to positive and negative wires—thus supplying an instrument for receiving the electric waves. Dr. O. J. Lodge devised the tapper, on the principle of the electric door bell, the hammer striking the wires attached to the Branly coherer, thus starting the electric oscillations and producing the electric waves. By means of the tapper, Dr. Lodge was able to regulate the length of the waves, making them correspond to the dots and dashes of the Morse telegraphic code. But Dr. Lodge was absorbed in the subject only from a purely scientific standpoint. Although he intimated that by the Branly coherer and the Lodge tapper signals might be transmitted through the air for a distance of half a mile, he made no effort to carry his experiments to a practical conclusion. Professor Popoff, the Russian scientist, made the next discovery. He attached a vertical wire to the Branly coherer to intercept the waves. He, too, used his discovery only for meteorological experiment and made no effort to adapt it to practical science. In 1901 Marconi sent a signal from St. John, N. F., to the Irish coast. In 1902 while on his way to the United States he received signals on board ship at a distance of 2099 miles. In 1903 a message from President Roosevelt was sent to King Edward from Cape Cod, Mass., direct to Poldhu, a distance of 3000 miles. In 1907 the ocean-going vessels plying between New York and Liverpool were constantly in touch with the land, the signals being picked up from one shore before being lost on the other. The war ships of all nations are now equipped with one or the other of the various systems and the signal service now warns vessels within 300 miles of the coast of approaching storms.

An achievement of wireless telegraphy that filled the civilized world with awe took place Jan. 23, 1909, when the big White Star liner Republic was disabled off Nantucket, Mass. The captain of the great vessel found his ship and his passengers in deadly peril. The engine room was full of water. No

craft was in sight. Land was 26 miles away. Wireless telegraphy, the once-doubted invention of the wizard Marconi, was the captain's only hope. He rushed to the operator. Frantically the man at the instrument sent up into the air the signal for help. He had no guidance but the hope that some where in the mysterious sky above him the desperate appeal would be caught by air waves and wafted to another ship, or to some wireless magician on land. The hope was not in vain. The message reached two other big liners and two revenue cutters. "In distress and sinking," it said, and gave the name of the ship, and the latitude and longitude. The Republic was saved!

WISCONSIN, one of the United States of North America, bounded north by Lake Superior, northeast by Michigan, east by Lake Michigan, south by Illinois, and west by Iowa and Minnesota, the Mississippi river separating it from these states; area, 56,040 sq. miles. It ranks twenty-first in size among the states. It consists of an undulating plateau, varying from 600 to 1500 feet above sea-level. Besides Michigan and Superior there are numerous small lakes; the chief rivers, which drain into the Mississippi, are the St. Croix, Chippewa, and Wisconsin. In winter the weather is severe, but on the whole the climate is dry and healthy. The annual rain fall is 31 inches. Agriculture is the chief industry, and the principal products are wheat, Indian-corn, and oats, besides rye, barley, potatoes, hops, and maple sugar. Cattle and horses are extensively reared, and agricultural and dairy produce are largely exported, as also lumber. The soils of the state are varied. Those of the drift-bearing region are derived from the heterogeneous mixture



Seal of Wisconsin.

of pre-glacial soils and glacial grindings, and constitute for the greater part loamy clays and sandy loams of a high degree of fertility and permanence. In the southwest a considerable portion of the soils are derived from the decomposition of the underlying limestone, and are highly fertile and easily tilled. In the central portion there is a considerable area underlaid by the Potsdam sandstone, from which sandy soils, of relatively low fertility, have been derived. The prevalent trees of this region are the oaks, poplars, hickories, and their usual associates. Along the eastern border of the state, except at the very south, is an extensive tract of heavy

timber, in which maple, elm, ash, and their usual associates predominate. Toward the north the pines, hemlocks, and spruces come in. The north part of the state was originally covered by an almost unbroken forest, composed of groves of pine, of hard wood, and of a promiscuous mixture of species embracing both conifers and deciduous trees. This constitutes the great lumber region of Wisconsin. The whitefish and lake-trout fishing industries of Lake Michigan and Lake Superior are extensive, and the inland lakes and streams abound in bass, pike, pickerel, sturgeon, and brook-trout. A state fisheries commission annually stocks the waters with brook-trout, whitefish, and pike. The manufactures in the cities are chiefly furniture, agricultural implements, carriages, saddlery, woolen goods, etc. There are extensive iron-mines, besides lead and zinc deposits and granite and limestone quarries. The Chicago, Milwaukee, & St. Paul, the Chicago Northwestern, the Wisconsin Central, the Chicago, St. Paul, Minneapolis & Omaha, St. Paul & Sault Ste. Marie, the Green Bay & Western, and the Chicago, Burlington & Northern are the principal railroads. Elementary education is compulsory between the ages of seven and fifteen (for 12 weeks each year); there are a number of universities and colleges, the Wisconsin university, Madison, being liberally subsidized by the state. The state is noted for its exceptionally large number of animal mounds, the work of the "mound-builders." Wisconsin was the meeting ground of the Algonquin and Dakota Indian tribes. Its water system connecting the Great Lakes and the Mississippi made it the keystone of the French possessions in Canada and Louisiana. In 1665 Father Claude Allouez founded a Jesuit mission at La Pointe, and in 1669 the mission of St. Francis Xavier on the shores of Green bay. Louis Joliet, leaving Quebec under orders to discover the South sea, in 1673, took with him Father Marquette from Mackinaw, and reached the Mississippi by the diagonal waterway of the Fox and Wisconsin rivers. In 1674 Marquette made a canoe trip from Green bay to the site of what is now Chicago along the shores of Lake Michigan. Wisconsin formed a part of the old Northwest territory from 1787 to 1800, of Indiana territory from 1800 to 1805, of Michigan territory from 1805 to 1809, of Illinois territory from 1809 to 1818, and in the latter year was again placed under the jurisdiction of Michigan territory. In 1836, on the admission of Michigan into the Union, Wisconsin—including then the present states of Iowa and Minnesota and parts of the Dakotas—was erected into a territory. The legislature met at Madison for the first time in 1838. Wisconsin was formally admitted to the Union May 29, 1848. The anti-slavery sentiment in the state was strong and the state furnished a total of 91,379 men, more than the required quota, the ratio being 1 man to every 9 of its inhabitants. The first republican governor was elected in 1856, when Coles Bashford was chosen after a bitter contest. Since that time the state has been republican in every

presidential election except that of 1892. Milwaukee is the chief town, Madison is the capital. Pop. 2,476,819.

WISCONSIN, University of, situated at Madison, was founded in 1838, organized in 1848, and opened for instruction in 1851. The institution is co-educational in all its departments. The College of Letters and Science is the center of the institution, about which the technical work has grown up. The other colleges are those of law, agriculture, and engineering. The College of Engineering includes courses in civil engineering, sanitary engineering, mechanical engineering, electrical engineering, and general engineering. The university confers the baccalaureate degree in arts, science, law, and philosophy; the master's degree in arts and science; the doctor's degree in philosophy; and the degrees of civil, mechanical, and electrical engineer.

WISDOM, Book of, called by the Septuagint the Wisdom of Solomon, one of the apocryphal books of the Old Testament. It was considered canonical by some of the fathers of the church, who ascribed its authorship to Solomon; but it is now generally held to be apocryphal, most theologians agreeing that its author must have been a Jew of Alexandria of the 1st or 2d century B.C.

WINSLOW, John Ancrum, American naval officer, was born at Wilmington, N. C., in 1811. He was engaged in the Mexican war, was present at the capture of Vera Cruz. On July 16, 1862, he was placed in command of the United States steamer Kearsage, specially commissioned to pursue the confederate steamer Alabama. Captain Winslow followed his adversary to Sherbourg, and in June, 1864, blockaded her in that harbor. The armament of the two vessels was about equal. After an exchange of broadsides for about an hour, the Alabama made for the shore in a crippled condition; she soon was found to be sinking, and surrendered. Captain Winslow was promoted commodore for this important victory in 1866, and in 1867 commanded the Gulf squadron, was chief of the Pacific squadron from 1870 to 1872, and on March 2, 1870, was promoted to be rear-admiral. He died in 1873.

WISE, Isaac Mayer, American rabbi and educator, was born at Steingrub, Bohemia, in 1819. In 1846 he came to the United States and from 1854 until his death he was rabbi of the Congregation Bene Yeshurun, Cincinnati. He was the editor of the Israelite, afterward The American Israelite, and the Chicago Israelite, both of which he established. In 1889 he organized the central conference of American rabbis and became its president. His works include History of the Israelitish Nation, Origin of Christianity, Judaism, Its Doctrines and Duties, etc., etc. He died in 1900.

WISE, Henry Alexander, American statesman, was born in Drummond-town, Va., 1806. In 1833 he was elected to congress as a Jackson democrat, and was twice reelected. In May, 1844, he was united States minister to Brazil, remaining there until October, 1847. In 1855 Mr. Wise was elected governor of Virginia. One of the last acts of his administration was signing the death-

warrant of John Brown, who was executed December 2, 1859. When Virginia seceded he became brigadier-general of the confederate army. After the war he resumed the practice of law. He died in 1876.

WISE, John S., was born at Rio Janeiro, Brazil, in 1846. He served through the war in the confederate army, being wounded at New Market. After the fall of the confederacy, he studied law, and upon his admission to the bar, in 1867, opened an office in Richmond. He was a Readjuster member of congress for one term from 1882, and in 1885 was defeated for governor of the state by Fitzhugh Lee. He is the author of Doomed, The End of An Era, and The Lion's Skin.

WISTARIA, a genus of plants. The species are deciduous, twining, and climbing shrubs, natives of China and North America. When in flower, they form one of the handsomest ornaments of the garden.

WISTER, Owen, American author, was born in Philadelphia, Pa., in 1860. His stories deal largely with Western life and character; his greatest success was The Virginian, published in 1902. Among his other works are: Lin McLean, Jimmy John Boss and other stories, Oliver Wendell Holmes, Benjamin Franklin. His latest work, Lady Baltimore, published in 1906, has met with general commendation.

WITCHCRAFT, a supernatural power which persons were formerly supposed to obtain by entering into compact with the devil, who engaged that they should want for nothing, and be able to assume whatever shape they pleased, to visit and torment their enemies, and accomplish their infernal purposes. As soon as the bargain was concluded, the devil was said to deliver to the witch an imp or familiar spirit, to be ready at call, and to do whatever it was directed. By the aid of this imp and the devil together, the witch, who was almost always an old woman, was enabled to transport herself through the air on a broomstick, and to transform herself into various shapes, particularly those of cats and hares; to inflict diseases on whomsoever she pleased, and to punish her enemies in a variety of ways. The belief in witchcraft is very ancient. It was a common belief in Europe till the 16th century, and maintained its ground with tolerable firmness till the middle of the 17th century. Indeed it is not altogether extinct even at the present day. Numbers of reputed witches were condemned to be burned, so that in England alone it is computed that no fewer than 30,000 of them suffered at the stake. The last victim was executed in 1722 in Scotland, and in the United kingdom prosecution for witchcraft was abolished in 1736 by act of parliament. In America the last executions took place in 1692, and in France executions for witchcraft were prohibited by an edict of Louis XIV. as early as 1670.

WITCH-HAZEL. See Wych-hazel.

WITH'ERITE, a mineral, a carbonate of baryta, used in making plate-glass, etc.

WITNESS, in law, (a) one who signs his name as evidence of the genuineness

of another signature; (b) a person who gives testimony or evidence under oath or affirmation in a judicial proceeding. See Evidence.

WITT, DE. See De Witt.

WOBURN, a town in Middlesex co., Massachusetts, 10 miles n.w. of Boston. Its principal industry is in the manufacture of leather. Pop. 14,499.

WODAN, Woden, the Anglo-Saxon form of the name of the deity called by the Norse Odin. Wednesday derives its name from him, and his name is also seen in several place-names, as Wednesday, etc. See Odin.

WOLCOTT, Roger, American political leader, was born in Boston, Mass., in 1847. From 1877 to 1879 he was a member of the Boston Common council, from 1882 to 1885 a member of the state house of representatives, and was then again a member of the common council from 1887 to 1889. In 1892 he was elected lieutenant-governor of the state. He was reelected in 1893, 1894, and 1895. Before the termination of his fourth term he became by the sudden death of Governor Greenhalge, in May, 1896, acting governor. In the following November he was chosen governor by the largest majority ever given to any candidate for that office in the history of the state, and was reelected in 1897 and 1898. He died in 1901.

WOLF, a quadruped belonging to the digitigrade carnivora, and very closely related to the dog. The common European wolf is yellowish or fulvous gray; the hair is harsh and strong, the ears erect and pointed the tail straight, or nearly so, and there is a blackish band or streak on the forelegs about the carpus. The height at the shoulder is from 27 to 29 inches. The wolf is swift of foot, crafty, and rapacious; a destructive enemy to the sheep-cote and farm-yard;



Common wolf.

it associates in packs to hunt the larger quadrupeds, such as the deer, the elk, etc. When hard pressed with hunger these packs have been known to attack isolated travelers, and even to enter villages and carry off children. In general, however, wolves are cowardly and stealthy. The wolf of North America is generally considered to be the same species as the European wolf, though individuals vary much in color and otherwise. The little prairie-wolf or coyote abounding on the vast plains of Missouri and Mexico, is a burrowing animal. The Tasmanian wolf is a marsupial.

WOLFE, Rev. Charles, author of the Ode on the Burial of Sir John Moore, was born in Dublin 1791, died 1823. He was also the author of several other poems.

WOLFE, James, an English general, was born at Westerham, Kent, in 1727. After distinguished service against the French in America he was intrusted (1759) with an army of 8000 men with which to assault Quebec. During the night this small force scaled the Heights



Gen. Wolfe.

of Abraham, which commanded the town, and in the battle which took place next day the British were victorious; but General Wolfe was wounded in the engagement, and died in the moment of victory, his opponent Montcalm being also mortally wounded.

WOLFFIAN BODIES (after Wolff, the discoverer), in physiology, a term applied to certain bodies in the vertebrate embryo, preceding the two kidneys, whose functions they perform. As the fœtus advances they gradually disappear, their place being supplied by the true kidneys, except in fishes, in which they are permanent.

WOLF-FISH. See Sea-wolf.

WOLFRAM, a native tungstate of iron and manganese. Its color is generally a brownish or grayish black. It occurs massive and crystalized, and in concentric lamellar concretions, and is the ore from which the metal tungsten is usually obtained.

WOLLASTON, William Hyde, a distinguished chemist, born in London 1776, died 1828. He was the inventor of the goniometer, an instrument for measuring the angles of crystals, and the discoverer of palladium and rhodium and the malleability of platinum.

WOLSELEY (wulz'li), Sir Garnet Joseph, Viscount Wolseley, British general, was born near Dublin in 1833; entered the army as ensign in 1852; took part in the second Burmese war; served in the Crimea, was wounded at the siege of Sebastopol; engaged in the siege and capture of Lucknow during the Indian mutiny of 1857-58; and was employed in 1860 in the Chinese war. He was despatched to Canada in 1861, and again in 1867, having received command of the Red river expedition, which he carried to a successful issue. When the Mahdi subdued the Soudan, and held General Gordon prisoner in Khartoum, Wolseley was despatched in 1884 with a relief expedition. He concentrated his forces at Korti, and sent a column across the desert to Khartoum, but the place had fallen. In 1885 he was created a viscount, in 1890-95 was commander-in-chief in Ireland, in 1894 made field-marshal; commander-in-chief of the army, 1895-1900. He is author of *Narrative of the War with China*, the *Soldier's Pocket Book*, *Life of the Duke of Marlborough*.

WOLSEY (wul'zi), Thomas, Cardinal,

was born at Ipswich in 1471. When Henry VIII. became king the advancement of Wolsey was rapid. Successively he was appointed Canon of Windsor, Dean of York, Bishop of Lincoln, Archbishop of York, and his nomination as cardinal in 1515 and pope's legate in 1518 completed his ecclesiastical dignities. In 1515 he was also appointed lord chancellor of the kingdom. This rapid preferment by the king was largely the result of a remarkable series of diplomatic victories, in which Wolsey had been the means of enabling Henry to hold the balance between Francis I. and the Emperor Charles V. In his ambitious career the cardinal made many enemies, who were held in check so long as he retained the favor of his royal master. This favor Wolsey lost when he failed to obtain from Pope Clement a decision granting the king's divorce from Catharine of Aragon. Thenceforth the enemies of the fallen prelate harried him unmercifully. He was banished from court, stripped of his dignities, found guilty of a præmunire, and sentenced to imprisonment. Finally, after a brief respite, during which he was restored to some of his offices, and had returned to his see of York, he was arrested at Cawood castle on a charge of high treason, and on his way to London as a prisoner he died in 1530 of dysentery at Leicester Abbey.

WOLSTONECRAFT, Mary (Godwin), English miscellaneous writer, was born at Hoxton, near London, April 27, 1759. In 1797, she married William Godwin, and became the mother of Mary, the future Mrs. Shelley. She died September 10, 1797. Mrs. Godwin was one of the 'advanced women' of her time. Her most notable work is *Vindication of the Rights of Women*. She attacked Rousseau's ideal woman, the heroine of novels and boarding-schools. She advocated the establishment of government day schools, and maintained the right of women to enter the professions and politics. In short, her thesis was the equality of the sexes. Among her other works are: *Thoughts on the Education of Daughters*; *Vindication of the Rights of Men*, a letter to Burke; *Letters and Miscellaneous Pieces*.

WOLVERHAMPTON, a municipal, county, and parl. borough of England, county of Stafford, 13 miles n.w. of Birmingham. The chief industries are the smelting of iron ore, and its conversion into all forms of iron-ware, and manufactures in brass, tin, steel, papier-mâché, galvanized iron, and chemicals. Pop. 192,750.

WOMAN'S CHRISTIAN TEMPERANCE UNION, the National W. C. T. U. was organized in Cleveland, Ohio, in 1874, and is the sober second thought of the great woman's crusade. It is now regularly organized in every state of the Union. There are about 10,000 local unions, with a membership and following, including the children's societies, of about half a million. The W. C. T. U. has forty distinct departments of work, presided over by as many women experts, in the National society, and in nearly every state. All the states in the republic have laws requiring the study of scientific temperance in the public

schools, and all these laws were secured by the W. C. T. U.; also the laws forbidding the sale of tobacco to minors. The first police matrons and most industrial homes for girls were secured through the efforts of this society, as were the refuges for erring women. Laws raising the age of consent and providing for better protection for women and girls have been enacted by many legislatures through the influence of the Union. The World's W. C. T. U. was founded through the influence of Francis E. Willard in 1883, and already has auxiliaries in more than fifty countries and provinces. The white ribbon is the badge of all the W. C. T. U. members, and is now a familiar emblem in every civilized country.

WOMAN'S SUFFRAGE, a movement for the social and political enfranchisement of women which first took practical shape in 1848 at Seneca Falls, N. Y. in which Elizabeth Cady Stanton, Lucretia Mott, Martha C. Wright and Mary A. McClintock were prime movers. In 1869 the National Woman's Suffrage association, with Susan B. Anthony and Elizabeth Cady Stanton as leaders, was organized. In November, 1890, the American Woman's Suffrage association was organized with Lucy Stone, and Julia Ward Howe as leaders. The two associations were in the same year united into the National American Woman's Suffrage association. In 1892 Mrs. Stone and Mrs. Stanton were made honorary presidents; Miss Anthony remained as the active president until 1900, when she was succeeded by Mrs. Carrie Chapman Catt. Women have secured full suffrage in Wyoming (1869), Colorado (1893), Utah (1870-1887 as territory; 1895), and Idaho (1896); municipal suffrage in Kansas (1887); school suffrage varying in extent, in 25 states; suffrage on questions of tax levies in Louisiana (1898); and on bond issues in Iowa (1894). Amendments have been submitted and campaigns fought in Kansas (1869, 1894), Michigan (1874), Nebraska (1882), Oregon (1884, 1900), Rhode Island (1886), Washington (1889, 1898), South Dakota (1890, 1898), and California (1896). Women in England, Scotland, and Ireland can now vote in all except parliamentary elections. Property laws were modified in 1882 and 1893. Women have full suffrage in New Zealand, the Isle of Man, Pitcairn Island, South Australia, and West Australia. Under the new federal constitution of Australia women may vote. In Canada, Cape Colony, and Tasmania women have municipal suffrage. An international council of women for the advocacy of women's rights met at Washington in 1888 and similar councils have since been held.

WOMB. See Uterus.

WOMBAT, a marsupial animal, a native of Australia and Tasmania. It is about 3 feet in length, and has coarse, almost bristly fur, of a general gray tint, mottled with black and white. It burrows, feeds on roots, and its flesh is said in fatness and flavor to resemble pork.

WOMEN'S CLUBS, the first organizations of women such as the Female Society for the Relief and Employment of the Poor, church societies, female

Bible societies, Daughters of Temperance, the Sanitary Commission, the Woman's Loyal League, the Freedmen's Bureau, which came into existence during the civil war, etc., showed women what they could do. In 1868 Mrs. Croly founded the Sorosis. This gave the impulse for other clubs. The Woman's Club of Brooklyn was organized in 1869-70. The Association for the Advancement of Women, organized in New York in 1873, decided to stimulate the formation of clubs. At a convention in 1890 the General Federation of Women's Clubs was formed. The Federation began with 63 clubs in seventeen states. There are now Federations in all the states with a total membership of about 225,000. The Woman's Cycle, which was started in September, 1889, published a directory of clubs. Biennial meetings of the federation are held in all the large cities.



Wombat.

WOMEN MARRIED, RIGHTS OF.

Any and all property which a woman owns at her marriage, together with the rents, issues, and profits thereof, and the property that comes to her by descent, devise, bequest, gift or grant, or which she acquires by her trade, business labor, or services performed on her separate account, shall, notwithstanding her marriage, remain her sole and separate property, and may be used, collected, and invested by her in her own name, and shall not be subject to the interference or control of her husband, or be liable for his debts, unless for such debts as may have been contracted for the support of herself or children by her as his agent. A married woman may likewise bargain, sell, assign, transfer and convey such property, and enter into contracts regarding the same on her separate trade, labor or business with the like effect as if she were unmarried. Her husband, however, is not liable for such contract, and they do not render him or his property in any way liable therefor. She may sue and be sued in all matters having relation to her sole and separate property in the same manner as if she were sole owner. In the following cases a married woman's contract may be enforced against her and her separate estate: 1. When the contract is created in or respecting the carrying on of the trade or business of the wife. 2. When it relates to or is made for the benefit of her sole or separate estate. 3. When the intention to charge the separate estate is expressed in the contract creating the liability. When a husband receives a principal

sum of money belonging to his wife, the law presumes he receives it for her use, and he must account for it, or expend it on her account by her authority or direction, or that she gave it to him as a gift. If he receives interest or income and spends it with her knowledge and without objection, a gift will be presumed from acquiescence. Money received by a husband from his wife and expended by him, under her direction, on his land, in improving the home of the family, is a gift, and cannot be recovered by the wife, or reclaimed, or an account demanded. An appropriation by a wife, herself, of her separate property to the use and benefit of her husband, in the absence of an agreement to repay, or any circumstances from which such an agreement can be inferred, will not create the relation of debtor and creditor nor render the husband liable to account. Though no words of gift be spoken a gift by a wife to her husband may be shown by the very nature of the transaction, or appear from the attending circumstances. A wife who causelessly deserts her husband is not entitled to the aid of a court of equity in getting possession of such chattels as she has contributed to the furnishing and adornment of her husband's house. Her legal title remains, and she could convey her interest to a third party by sale, and said party would have a good title, unless her husband should prove a gift. Wife's property is not liable to a lien of a sub-contractor for materials furnished to the husband for the erection of a building thereon, where it is not shown that the wife was notified of the intention to furnish the materials, or settlement made with the contractor and given to the wife, her agent or trustee. The common law of the United States has some curious provisions regarding the rights of married women, though in all the states there are statutory provisions essentially modifying this law. As it now stands the husband is responsible for necessities supplied to the wife even should he not fail to supply them himself, and is held liable if he turn her from his house, or otherwise separates himself from her without good cause. He is not held liable if the wife deserts him, or if he turns her away for good cause. If she leaves him through good cause, then he is liable. If a man lives with a woman as his wife, and so represents her, even though this representation is made to one who knows she is not, he is liable the same way as if she were his wife.

WONDERS OF THE WORLD, Seven. See Seven Wonders.

WOO-CHANG, a city of China, province of Hu-Pé, on the Yang-tse-kiang, opposite the city of Hankow. The latter is in effect but a suburb of Woo-Chang, another portion on the n. bank of the river being Hang-Yang-Foo. It is the great emporium for the tea exported by way of Shanghai. Pop. 1,000,000.

WOOD. See Timber.

WOOD, Ellen, or Price, English novelist, better known as Mrs. Henry Wood, born at Worcester 1820, died 1887. Among her many novels may be noted East Lynne, which has had an enormous success both as a book and a

drama; The Channings; St. Martin's Eve; A Life's Secret; Roland Yorke; Dene Hollow; and the Johnnie Ludlow Stories, reprinted from the Argosy, of which she was long editor.

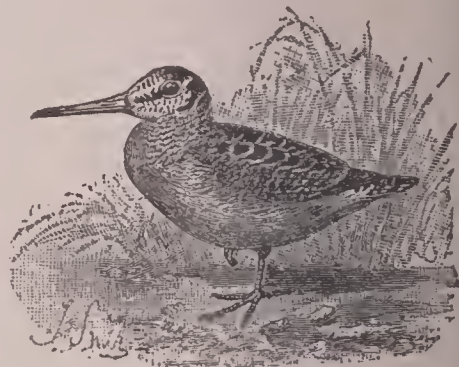
WOOD, Rev. John George, naturalist, born in London 1827, died suddenly at Coventry 1889. He was an enthusiast in natural history, and published a large number of books on zoology and kindred subjects which had great popularity. Among the best known of them are: Common Objects of the Sea-shore, Common Objects of the Country, Homes without Hands, Insects at Home, Natural History of Man, and an admirable illustrated Natural History of Animals.

WOODBINE. See Honeysuckle.

WOOD CHARCOAL. See Charcoal.

WOOD-CHUCK, the popular name of a rodent mammal, a species of the marmot tribe, the ground-hog, common in the United States and Canada. It is of a heavy form, from 15 to 18 inches long, blackish or grizzled above and chestnut-red below. It forms burrows in which it passes the winter in a dormant state.

WOODCOCK, a bird of the same genus as the snipe. It is widely distributed, being found in all parts of Europe, the north of Asia, and as far east as Japan. It is a game bird of Britain, where it is known chiefly as a winter visitant, but



American woodcock.

also breeds in certain districts. The bird is about 13 inches in length, the female being somewhat larger than the male. Its food is, chiefly worms. The American woodcock is a smaller bird, but very similar in plumage and habits.

WOOD, Fernando, American politician, was born in Philadelphia in 1812. He removed to New York in 1820 and was elected to congress in 1841. In 1854, he was elected mayor of New York, and during his administration brought about reforms that so impressed citizens with the value of his services, that he was reelected almost unanimously. In 1860 he was once more elected mayor and during this term he was subject to wide criticism and ridicule by suggesting the secession of New York at the outbreak of the civil war, and in 1863 was returned to congress, where he remained until 1865; he was reelected in 1867 and served until 1877. He died in 1881.

WOOD, Leonard, American soldier, was born in Winchester county, Vt., in 1860. In 1886 he was appointed first lieutenant and assistant surgeon in the regular army. Upon the outbreak of the Spanish-American war Wood and

Theodore Roosevelt organized the regiment of "Rough Riders" and Wood was made Colonel and Roosevelt lieutenant-colonel. In 1898 he was made a brigadier-general of volunteers and in 1901 brigadier-general in the regular army. He was put in charge of Santiago after its surrender. In 1899 he was appointed governor-general of Cuba. In 1903 he was placed in command of a division of the army of the Philippines and was made major-general.

WOOD ENGRAVING. See Engraving.

WOOD-OIL, a balsamic substance (an oleoresin) obtained from several species of trees growing in Pegu, Assam, and some of the islands of the Indian archipelago. It is used medicinally, as a varnish, in lithographic ink, etc.

WOODPECKER, a name for the birds belonging to the order Scansores or climbers. They are characterized by their long, straight, angular beak, adapted for splitting the bark of trees; by their slender tongue, with its spines at the tip curved backward to enable them to extract insects from crevices; and by their stiff tail, which acts as a prop to support them while climbing. The noise they make in tapping the bark of a tree to discover where an insect is lodged can be heard at a considerable distance. In America the most characteristic species are the ivory-billed woodpecker, gold-winged woodpecker, and the California woodpecker.

WOOD-PIGEON. See Ring-dove.

WOODMEN OF AMERICA, Modern, a fraternal and insurance order founded at Lyons, Iowa, in 1883, and chartered under the laws of Illinois in 1884. Divisions or branches are known as camps. It has camps in Illinois, Minnesota, Nebraska, Wisconsin, Michigan, Kansas, North Dakota, South Dakota, Missouri, Indiana and Ohio. The membership is about 850,000.

WOO-HOO, or **WUHU**, a treaty-port of China, on the Yang-tze-kiang, about 50 miles above Nanking, opened to trade in 1877. Pop. 79,000.

WOOL, that soft species of hair which grows on sheep and some other animals, as the alpaca, some species of goats, etc., which in fineness sometimes approaches to fur. Wool is divided into two classes—short or carding wool, seldom reaching over a length of 3 or 4 inches, and long or combing wool, varying in length from 4 to 8 inches, each class being subdivided into a variety of sorts, according to their fineness and soundness of the staple. Wools which unite a high degree of fineness and softness with considerable length of staple, bear a high price. English-bred sheep produce a good, strong, combing wool, that of the Scotch breeds being somewhat harsher and coarser. The finest carding wools were formerly exclusively obtained from Spain, the native country of the merino sheep, and at a later period extensively from Germany, where that breed had been successfully introduced and cultivated. The chief wool-producing countries of the world are: Argentina, Uruguay and other South American countries; Australia and New Zealand; the United States; Russia, Great Britain and Ireland, France, Spain; South Africa and India. The wool clip of the

United States is 300,000,000 pounds annually, the product of 50,000,000 sheep. The principal wool-producing states are Montana, New Mexico, Ohio, Texas, Wyoming, Colorado, Oregon, Idaho, California, Utah, Michigan and Arizona.

WOOLEN MANUFACTURE, the use of wool as an article of clothing dates from the earliest times, and no doubt it was made into cloth earlier than either flax or cotton. Among the ancient Jews wool was the staple material of clothing; and the woollen fabrics of ancient Greece and Rome attained special excellence. In time the Roman manufactures were carried to the countries in which Roman colonies had been established. In England the making of woollen cloth seems to have been introduced by the Romans, but it did not rise into importance as a national employment until much later. The woollen cloths of England were for a considerable time confined to the coarser fabrics of domestic manufacture, finer cloths being imported from the continent, particularly from Brabant. At various times also the trade was hampered by many illiberal laws for its regulation, for prohibiting exportation, etc. In making woollen cloth the essential processes, as carried on in modern factories, are:—(1) the stapling of the raw wool. In this process the stapler or sorter works at a table covered with wire netting, through which the dirt falls while the various qualities of wool are being separated. The wool is then ready to be put through the (2) scouring machine, where it passes on an endless apron into an oblong vat, which contains a steaming soapy solution. Here it is carried forward gently by means of rakes until it is thoroughly soaked and cleansed. After this it is taken to the (3) drying framework of wire netting, under which are situated steam-heated pipes. A fan-blast drives the heated air upward through the wet wool, which lies on the wire netting, until it is all equally dried. When necessary this is the point in the process when it is "dyed in the wool." It is then ready for the (4) willeying or teasing machine, which consists of a revolving drum furnished with hooked teeth, close above which are set cylinders with hooked teeth moving in a contrary direction. The wool is fed in upon the drum, which whirls with great speed; and between the two sets of teeth working in opposite directions it is disentangled, torn, and cast out in fine, free fibers. With some classes of wool it is also necessary, at this stage, to remove suds and burrs by steeping them in a solution of sulphuric acid, or passing them through a burring machine, by which the burrs are extracted. The wool is now dry and brittle; and before submitting it to the process (5) of carding, it is sprinkled with oil and well beaten with staves in order to give it suppleness. This process of carding is accomplished by a series of three delicate and complex machines called a scribbler, an intermediate, and a finisher. These machines have various intricate cylinders and rollers, studded with teeth and working in opposite directions, over which the wool is passed until it is torn,

interblended, and finally delivered from the finisher in a continuous flat lap. It is then cut into strips and passed (6) to the condensing machine, which rubs the strip into a soft, loose cord or sliver technically called a "slubbing." The wool is now ready for (7) spinning into yarn, and this is accomplished in a wool-spinning mule, which draws and twists the sliver into the required thinness, the process being essentially the same as in cotton-spinning. (See Cotton-spinning.) The wool, which has thus been brought into the form of yarn, is now fit for (8) weaving into woollen cloth. (See Weaving.) When it is taken out of the loom the cloth is washed, to free it from oil and other impurities, and also beaten while it lies in the water by wooden hammers moved by machinery, while it is again dyed if found necessary. After it has been scoured in water mixed with fullers' earth, the cloth undergoes a process of (9) teasing and shearing (see Teasel), in which the pile or nap is first raised, and then cut to the proper length by machines. When this is done it is (10) steamed and pressed between polished iron plates in a hydraulic press. In the manufacture of worsted yarn the long-staple wool fibers are brought as far as possible into a parallel condition by processes called gilling and combing. The wool, in a damp condition, is passed through a series of "gill boxes," in which steel gills or combs separate and straighten the fibers until, from the last box, it issues in a long sliver. In this condition it is run through a delicate combing machine. From the combing machine it is delivered in the condition of a fine sliver technically called top, and after being further attenuated by a process of roving the thread is spun into yarn on what is called a throstle-frame.

WOOLWICH (wyl'ich), a metropolitan municipal and parliamentary borough of England, on the Thames, 8 miles below London bridge. It stretches about 3 miles along the river, and owes its importance to the great arsenal, which has a circumference of 4 miles, and consists of gun and carriage factories, laboratory, barracks, ordnance departments, etc. Pop. 117,157.

WOONSOCKET, a town in Providence county, Rhode Island, about 40 miles s.w. of Boston. Its manufacturing establishments include cotton and woollen factories, machine-shops, rubber-works, iron-foundries, etc. Pop. 33,104.

WORCESTER (wus'ter), capital of Worcestershire, and one of the most ancient cities in England, on the eastern bank of the Severn, 114 miles n.w. of London. Pop. 46,623. The county is bounded n. by Shropshire and Staffordshire, e. by Warwickshire, s. by Gloucestershire, and w. by Herefordshire; area, 472,453 acres, about half of which is in permanent pasture. The carpets of Kidderminster are famous, as are also the gloves and porcelain of Worcester. Pop. 488,401.

WORCESTER, a town in Massachusetts, about 40 miles west of Boston. It is situated in a fertile agricultural district, and is considered one of the finest towns in New England. It has manufactures of iron goods of various

kinds, including machinery, tools, etc.; also of woollens, carpets, boots and shoes, leather, paper, musical instruments, etc. Pop. 1909, 143,000.

WORCESTER, Edward Somerset, Marquis of, one of the earliest inventors of a steam-engine, was born about 1601, and died 1667.

WORCESTER, Joseph Emerson, philologist, born in Bedford, N. H., August 24, 1784. As a boy he worked on a farm, and in 1811 was graduated at Yale. In 1830 he visited Europe, and in 1847 received the degree of LL.D. from Brown, which was duplicated by Dartmouth in 1856. Doctor Worcester delivered lectures, edited a variety of gazetteers, geographics, histories, and almanacs, and finally made a life work of his Dictionary of the English Language, the first illustrated Dictionary in English. An enlarged edition appeared in 1881. He died in 1865.

WORDSWORTH, William, English poet, was born at Cockermouth, Cumberland, 7th April, 1770, and died 23d April, 1850. He crossed to France in November, 1791, and exhibited vehement sympathy with the revolution, remaining in France for nearly a year. After his return, disregarding all entreaties to enter upon a professional career, he published his *Evening Walk and Descriptive Sketches* (1793). With the consecrated helpfulness of his sister Dorothy he contrived to keep house for eight years, while he gave himself to poetic effort as his high "office upon earth." For the first two years they lived at Racedown in Dorset, where the



William Wordsworth

poet among other experiments began his tragedy of *The Borderers*. In this retreat they were visited (1797) by Coleridge, who had already recognized an original poetic genius in the author of *Descriptive Sketches*. Coleridge was at this time living at Nether Stowey, in Somerset, and during this visit he induced the Wordsworths to go into residence at Alfoxden, in his immediate neighborhood. Here the two poets held daily intercourse, and after a twelve-month they published *Lyrical Ballads* (1798) in literary copartnership. Wordsworth's great philosophic poem, which, in his own phrase, was to be the Gothic

cathedral of his labor, received only a fragmentary accomplishment in *The Prelude*, *The Excursion*, and *The Recluse*. Yet enough was achieved in his smaller poems to justify his own conception of himself as a "dedicated spirit," and to set him apart among the greatest of England's poets.

WORKHOUSE, a house in which paupers are maintained at the public expense, those who are able-bodied being compelled to work. Under the old poor-laws of England, there was a workhouse in each parish, partaking of the character of a bridewell, where indigent, vagrant, and idle people were set to work, and supplied with food and clothing, or what is termed indoor relief. These workhouses were described as, generally speaking, nurseries of idleness, ignorance, and vice; but a new system was introduced in 1834, parishes being now united for the better management of workhouses, which gave rise to the poor-law unions, with their workhouses. In these establishments the pauper inmates are employed according to their capacity and ability. Religious and secular instruction is supplied, while habits of industry, cleanliness, and order are enforced.

WORLD'S COLUMBIAN EXPOSITION, an international exposition held in Chicago in 1893 to celebrate the four hundredth anniversary of the landing of Columbus. The funds for the exposition consisted of \$10,000,000 raised by the city of Chicago, a loan of \$2,500,000 from congress, debenture bonds for \$5,000,000 issued by the exposition authorities, together with miscellaneous contributions from various sources of about \$3,000,000, making a total fund of about \$20,000,000. Jackson park in the southeastern part of Chicago, on the shore of Lake Michigan, covering an area of 666 acres, was chosen as the site, where 150 different buildings were erected. The principal buildings were constructed of composition called staff, consisting of a mixture of plaster of Paris, with a little cement, glycerin, and dextrin, in water, which at a short distance gave the effect of marble. This appearance led to the name of White City, by which the exposition subsequently became generally known. The amusement features were in the Midway Plaisance, a strip of land west of Jackson park, and of these most worthy of note was the huge Ferris Wheel, 264 feet high. The total attendance at the exposition was 27,539,041, of which 21,479,661 were paid. The largest attendance was on Chicago day, October 9th, when there were 761,942 paid admissions. There were 65,422 exhibitors representing over 250,000 separate exhibits. At the close of the exposition the total receipts from all sources were \$33,290,065, while the total disbursements were \$31,117,353.

WORMS, a term loosely applied to many small longish creeping animals, entirely wanting feet or having but very short ones, including such various forms as the earthworm, the larvæ or grubs of certain insects, intestinal parasites, as the tape-worm, thread-worm, etc. In zoological classifications it is used as equivalent to Vermes or to Annelida. In medicine it is applied to the parasitic

animals which exist chiefly in the intestines, and to the disease due to the presence of such parasites. Several kinds of worms may infest the human body, but the worms with which children are so commonly annoyed are the small worms known as thread-worms. Vermifuges or anthelmintics are names given to medicines that cure worms such as extract of male-fern root for tape worms, santonin for thread-worms. See Wormwood, Tape-worm.

WORMS, a town in Germany, in the Grand-duchy of Hesse, on the Rhine, 25 miles s. of Mainz, and 20 miles n.w. of Heidelberg. The chief buildings of interest are the Romanesque cathedral (12th century), a magnificent structure with four round towers and two large domes; the Liebfrauenkirche and church of St. Martin; the town-house; and the monument to Luther, consisting of a colossal statue on a raised platform surrounded by figures of precursors of or persons directly connected with the Reformation. At Worms was held the famous diet in 1521, at which Luther defended his doctrines before the emperor Charles and an august assemblage. Pop. 40,705.

WORM-SEED, a seed which has the property of expelling worms from the intestinal tube or other open cavities of the body. It is brought from the Levant, and is the produce of a species of plant which is a native of Tartary and Persia.

WORMWOOD, a well-known plant, celebrated for its intensely bitter tonic and stimulating qualities, which have caused it to be an ingredient in various medicinal preparations, and even in the preparation of liquors. It is also useful in destroying worms in children.

WORSTED, a variety of woolen yarn or thread, spun from long-staple wool which has been combed, and which in the spinning is twisted harder than ordinary. It is knit or woven into stockings, carpets, etc. The name is derived from Worsted, a village in Norfolk where it is supposed to have been first manufactured.

WORT. See Brewing.

WOUND, in surgical phrase, a solution of continuity in any of the soft parts of the body occasioned by external violence, and attended with a greater or less amount of bleeding. Wounds have been classified as follows: (a) Cuts, incisions, or incised wounds, which are produced by sharp-edged instruments. (b) Stabs or punctured wounds, made by the thrusts of pointed weapons. (c) Contused wounds, produced by the violent application of hard, blunt, obtuse bodies to the soft parts. (d) Lacerated wounds, in which there is tearing or laceration, as by some rough instrument. (e) All those common injuries called gunshot wounds. (f) Poisoned wounds, those complicated with the introduction of some poison or venom into the part.

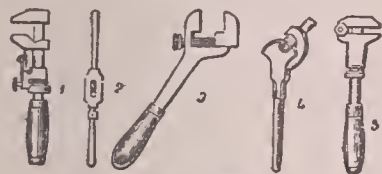
WRECK, in law, is defined as such articles of value as are cast upon land by the sea, includes jetsam, flotsam ligan, and derelict.

WREN, a name given to certain birds closely allied to the warblers, distinguished by their small size, slender beak, short, rounded wings, mottled

plumage, and the habit of holding the tail erect. The American house-wren is a very familiar bird, and a general favorite in America.

WREN, Sir Christopher, English architect, born in 1631, died in 1723. He had been appointed by Charles II. to restore old St. Paul's, but after the great fire (1666) it became necessary to rebuild the cathedral. The cathedral was begun in 1675, and the architect saw the last stone laid by his son thirty-five years afterward. Among the other notable buildings which Wren designed are: the modern part of the palace at Hampton court, the library of Trinity college, Cambridge, the hospitals of Chelsea and Greenwich, the churches of St. Stephen's, Walbrook; St. Mary-le-bow; St. Michael, Cornhill; St. Bride, Fleet street; as also the campanile of Christ church, Oxford. In 1680 he was chosen president of the Royal society, appointed in 1708 surveyor of the royal works, and from 1685 to 1700 represented various boroughs in parliament. Over the north doorway of St. Paul's is a memorial tablet on which are the well-known words: *Si monumentum requiris, circumspice.*

WRENCH, an instrument consisting essentially of a bar of metal having jaws adapted to catch upon the head of a bolt or a nut to turn it; a screw-



Wrenches.

1. Screw-wrench.
2. Tap-wrench.
3. Angle-wrench.
4. Tube-wrench.
5. Monkey-wrench for hexagonal and square nuts.

key. Some wrenches have a variety of jaws to suit different sizes and shapes of nuts and bolts, and others, as the monkey-wrench, having an adjustable inner jaw.

WRIGHT, Carroll Davidson, American economist, was born in Dumbarton, N. H., in 1840. He was elected to the Massachusetts senate in 1873, was chief of Labor statistics of Massachusetts from 1873 to 1888 and superintended the United States censuses of 1875 and 1885. From 1885-92 he was United States commissioner of labor. He was appointed by President Roosevelt in 1902 one of the commissioners to arbitrate the strike of the anthracite coal mines. In 1902 he accepted the presidency of Clark university. He was one of the original trustees of the Carnegie institute. His writings include a large number of essays and *The Industrial Evolution of the United States* and *Outlines of Practical Sociology*.

WRIGHT, Luke E., American lawyer and administrator, was born in Memphis, Tenn., in 1847. In 1900 he was appointed by President McKinley a member of the Philippine commission. In 1901 on the establishment of civil government in the islands he became vice-governor and acting governor during Governor Taft's absence in the United States and Europe in 1902. In 1903 he became governor of the Philippines.

WRIST. See Hand.

WRIT, in law, a precept under seal in the name of the sovereign, a judge, or other person having jurisdiction, and directed to some public officer or private person, commanding him to do a certain act therein specified. Writs in English law were formerly very multifarious, but a great number have been abolished.

WRITER'S CRAMP, a spasmodic affection in which the patient loses complete control over the muscles of the thumb and the fore and middle finger, so that all attempts to write regularly, and in the severer cases even legibly, are unsuccessful. The various methods of treatment for this trouble (such as surgical operations, the application of electricity, etc.) have not produced very satisfactory results. Called also *Scrivener's Palsy*.

WRITING, one of the oldest arts, is usually divided into ideographic writing, in which signs represent ideas, and into phonetic writing, in which signs represent sounds. Ideographic writing, in its earliest form, is supposed to have been an attempt to convey ideas by copying objects direct from nature, and this form of it has thus acquired the name of picture writing. After this came symbolical writing, in which abbreviated pictures were used as arbitrary symbols, first of things, and still later of sounds and words. This indicates the transition into phonetic writing, in which the signs may either represent a whole syllable (syllabic writing), or only a single sound, in which case they are called alphabetic. These signs differ in form and use in the various alphabets. Thus the Chinese signs are read in columns from top to bottom, the Mexican picture writing from bottom to top, the Hebrew writing from right to left, and Latin, Greek, and all European languages as well as Sanskrit from left to right. (See Alphabet.) In the Chinese system of writing there is no alphabet, the characters being syllabic and strictly ideographic. Writing was introduced to the western nations by the Phœnicians, and the Phœnician system was based on the Egyptian. The cuneiform writing, another ancient system, invented by the Accadian inhabitants of Chaldea, was also adapted to several languages, as the Assyrian, the Persian, etc., in a variety of ways, ideographic, syllabic, and alphabetic (see Cuneiform Writing). Also of independent origin is the Chinese system. The Egyptians had three distinct kinds of writing, the hieroglyphic, the hieratic, and the enchorial or demotic (see Hieroglyphic), and it was from the second that the Phœnician and other Semitic systems of writing were derived. The leading Semitic forms are the Samaritan or ancient Hebrew, the Chaldee or East Aramaic, the Syriac or West Aramaic, the Kufic or early Arabic, and the Neshki or modern Arabic. At what time writing was introduced into ancient Greece is not known with certainty, but probably between the 10th and the 7th century B.C. From Greece it passed to Sicily and Italy, and thence it was spread as Christianity spread. Like the Semites the Greeks originally wrote from right to left. In mediæval manuscripts a variety

of styles were adopted in different epochs and countries. Capitals were not then used as now to distinguish prominent words, but whole manuscripts were written in large or small capitals. Uncial letters, which prevailed from the 7th to the 10th centuries, were rounded capitals with few hair-strokes. Gothic characters, which were merely fanciful deviations from the Roman types, became common in inscriptions from the 13th to the 15th centuries, and were employed in church books from the time of St. Louis. In England a variety of styles called Saxon prevailed in the early middle ages. A mixed style was formed of a combination of Roman, Lombardic and Saxon characters; the Norman style came in with William the Conqueror; and the English court hand, an adaptation of Saxon, prevailed from the 16th century to the reign of George II. There have been various attempts made to introduce systems of phonetic writing, in which each sound should be represented by one invariable sign. Systems of shorthand writing are generally phonetic. See Shorthand.

WRYNECK, a bird allied to and resembling the woodpeckers. It is remarkable for its long tongue, its power



Common wryneck.

of protruding and retracting it, and the writhing snake-like motion which it can impart to its neck without moving the rest of the body. It feeds chiefly on insects.

WURTEMBERG (vür'tem-berh), or **WURTEMBERG**, a kingdom of the German empire, between Bavaria, Baden, Hohenzollern, and the Lake of Constance, which separates it from Switzerland; area, 7531 sq. miles; pop. 2,169,434. In the west the Schwarzwald, or Black Forest forms part of the boundary, and the Alb or Rauhe Alp, forming part of the Franconian Jura, covers an extensive tract. The country belongs in large part to the basin of the Rhine, being drained northward into that river by the Neckar, while the Danube flows across the southern districts. In the lower and more favorable districts the fig and melon ripen in the open air, and the vine, cultivated on an extensive scale, produces several first-class wines; corn, wheat, hops, tobacco, and fruit, which is employed in cider making, are largely cultivated. About a third of the country is under forests, which consist chiefly of oaks, beeches, and pine. Of minerals, by far the most valuable are iron and salt, both of which are worked by the government; the others are limestone, gypsum, alabaster, slate, millstones, and potters'-

clay. The manufactures consist chiefly of cotton, woolen, and linen goods, paper, wooden clocks, toys, musical instruments, and chemical products. The government is an hereditary constitutional monarchy, the executive power being lodged in the sovereign, and the legislative jointly in the sovereign and a parliament, composed of an upper and a lower chamber. The latter, which is elected every six years, is composed of ninety-three members. In the Bundesrath Würtemberg is represented by four members, and in the Reichstag by seventeen. Education is generally diffused, and the center of the educational system is the University of Tübingen. Besides Stuttgart (the capital), the chief towns are Ulm, Heilbronn, and Esslingen. It became a member of the German empire on its foundation in 1871.

WURZBURG (vürts'burh), a town in the northwest of Bavaria, on the Main, 60 miles s.e. of Frankfurt. The most important edifices are the Romanesque cathedral, erected in the 10th century; the university, with various new buildings; the Julius hospital and school of medicine, and the royal palace. The university library has 200,000 volumes, and in other respects the university, especially in the medical faculty, is well equipped. The manufactures are varied in character. Pop. 75,497.

WY'ANDOTS (in Canada called Hurons), an Indian tribe in North America belonging to the Iroquois family. In the beginning of the 17th century they were settled on the eastern shore of Lake Huron, but in a tribal war (1636) they were nearly exterminated by the Iroquois. The tribe then suffered various vicissitudes. In 1812 a number of their warriors fought on the side of the British. Latterly a small number got a reservation in the Indian territory, but they are now very few in numbers.

WYANDOTTE CAVE, situated 5 miles n. of Leavenworth, Indiana, has been explored for over 20 miles, and rivals the Mammoth Cave in the size of some of its chambers and in its stalagmites and stalactites.

WYATT, Sir Thomas, the first writer of sonnets in the English language, born in 1503, died 1542. His poetical works, which include elegies, odes, and a metrical translation of the Psalms, were published in 1557, along with those of his friend the Earl of Surrey.

WYCHERLEY, William, an English dramatist, born about 1640 at Clive, near Shrewsbury; died 1715. His early years were spent in France, afterward he was educated at Oxford, and entered himself at the Temple; while in 1670 he became known as a fashionable man about town and the author of *Love in a Wood*. This comedy was followed by the *Gentleman Dancing Master*, the *Country Wife*, and the *Plain Dealer*. Wycherley is the typical dramatist of the Restoration group, in which all the

brilliancy and dissoluteness of that school are very prominent.

WYCH-HAZEL, the common name of small trees, with alternate leaves on short petioles, and yellow flowers disposed in clusters in the axils of the leaves, and surrounded by a three-leaved involucre. They are natives of North America, Persia, or China, and are very different from the true hazel. The Virginian wych-hazel is medicinally important.

WYCLIFFE. See Wickliff.

WYOMING, one of the northwestern states of the Union, is bounded on the n. by Montana, on the e. by South Dakota and Nebraska, on the s. by Colorado and Utah, and on the w. by Utah, Idaho, and Montana. Area, 97,890 sq. miles. It ranks sixth in size among the states. The state is traversed by the main axis of the Rocky mountains, and the greater part of it is a mountainous region. Yellowstone National park, 3600 sq. miles in area, occupies the northwestern corner, and is mainly within the limits of this state. The southwestern portion of the state slopes toward the Pacific ocean, and forms a part of the Green river valley. The eastern part of the state is drained by tributaries of the Missouri, the west-



Seal of Wyoming.

ern by the Snake or Shoshone river, which ultimately joins the Columbia, and in the southwest is the Green river, which eventually discharges its waters into the Colorado. The climate is dry and sunny and as a rule very pleasant and healthful. The winters, though very cold, are not exceedingly severe, as the snowfall is light, and the dry air makes the cold easily endurable. The average annual precipitation for the state is 13 inches, and the soil is generally a light sandy loam, becoming darker and richer in the river valleys. In the arid Red desert region the soil over large areas is strongly impregnated with saline matter and poor in humus. The coal resources of the state are enormous and give promise of playing an important part in the future development of the state. The state has also deposits of gold and silver, copper, iron, soda, some

tin and an abundance of limestone. The numerous oil fields have begun to be developed. In the central part of the state a lubricating oil of superior quality is produced. Over one half of the area of the state is adapted to grazing. Wyoming raises more sheep than any other state, the breed is of superior quality and the yield of fleece is very large. Cattle-raising is also very important. The state produces a hardy stock of horses. About 90 per cent of the acreage devoted to crops is given to hay and forage. The climate is too severe for corn, but oats and wheat grow abundantly. Potatoes are a favorite crop. The hardier fruits and vegetables are successfully raised. The total wooded area of the state is estimated at 12,500 sq. miles, two-thirds of which, however, are in the Yellowstone National park and the United States reserves. The manufactures are limited to products for home consumption. The State university, chartered in 1886, is located at Laramie, and is the leading educational institution in the state. There are numerous public schools of all grades and many valuable libraries; also hospitals and charitable institutions. A fur-trading post established at what is now Fort Laramie, in 1834, is believed to have been the first white settlement in Wyoming. The state comprises portions of the territory acquired by the Louisiana purchase of 1803, and of that obtained by the treaty with Mexico in 1848. In 1867 the discovery of gold led to the founding of South Pass City, and the same year Cheyenne was laid out by the Union Pacific Railroad company. The surrounding country, which was without government of any sort, was formed into Laramie county, Dak., and a vigilance committee kept order. The territorial government was organized in 1869, and the same year woman's suffrage was adopted and has been maintained to the present time. The state was admitted to the Union July 10, 1890, as the constitution adopted in November, 1889, had been approved by congress. In national politics the state voted first in 1892 for the republican candidates. The free-silver agitation in 1896 carried it into the democratic column, but in 1900, 1904 and 1908 republican electors were chosen. The largest cities are Cheyenne, the capital, with a population of 16,841, and Laramie, 9865. The population of the state is 125,000.

WYOMING, University of, a coeducational state institution at Laramie, Wyo., founded in 1887 on the federal land grants. Its departments include colleges of liberal arts, agriculture, and mechanical engineering, a school of commerce, a school of mines, and normal, graduate, and preparatory departments. It confers the bachelor's degree in arts, sciences, and pedagogy, and gives the master's degree for advanced work.

X

X, the twenty-fourth letter of the English alphabet. Except when used at the beginning of a word, x in English is a double consonant, and has usually the sound of ks, as in wax, lax, axis, etc.; but when terminating a syllable, especially an initial syllable, if the syllable following it is open or accented, it often takes the sound of gz, as in exist, exhaust, exalt, example, etc. At the beginning of a word it has precisely the sound of z.

XANTHIPPE. See Socrates.

XAVIER, St. Francis (zav'i-er), sur-named the apostle of the Indies, was born in 1506 at the castle of Xavier in Navarre. He fell under the personal influence of Ignatius Loyola, and became one of the first members of Loyola's Society of Jesus. Having been appointed papal nuncio in the Indies, in 1542 he reached Goa, where, and in other parts of India, notably in Travancore, he prosecuted with success his missionary labors. After proselytizing at Ceylon, at Malacca, and in the Moluccas, he visited Japan, where he established a promising mission. In 1552 he started for China in the hope of converting it to Roman Catholic Christianity, but died in 1552, when at no great distance from Canton. He was canonized in 1621.

XEBEC, a three-masted vessel, formerly much used by the Algerine corsairs, and still to a small extent employed in



Xebec of Barbary.

Mediterranean commerce. It differs from the felucca chiefly in having several square sails, as well as lateen sails, while the latter has only lateen sails.

XENOC'RATES, of Chalcedon, Greek philosopher, a disciple of Plato, born 396 B.C., and from 339 until his death, 314 B.C., head of the famous Academy at Athens.

XENOPH'ANES, of Colophon, Greek philosopher, born probably about 330 B.C., for some time settled at Elea, and regarded as the founder of the Eleatic school of philosophy.

XEN'OPHON, the Greek historian and essayist, born at Athens about 430 B.C.; became early a disciple of Socrates. In 401 B.C., partly from curiosity, and in no military capacity, he joined the Greek mercenaries attached to the force led by Cyrus the Younger against his brother Artaxerxes II. After the defeat and death of Cyrus on the

field of Cunaxa, the chief Greek officers were treacherously assassinated by the victorious satrap. Xenophon now came to the front, and mainly conducted the famous retreat of the 10,000 through wild and mountainous regions, often harassed by the guerrilla attacks of barbarous tribes, until after a five months' march they reached Trebizond on the Black Sea, February 400 B.C. The expedition and its sequel form the subject of his best-known work, the *Anabasis*. Xenophon fought on the side of the Lacedæmonians in the subsequent war between Sparta and Persia, and rose from poverty to competence through the ransom which he received from a wealthy Persian nobleman whom he had captured. With Agesilaus, under whom he had already served, he fought at Coroneia (394 B.C.) against his own countrymen, and was on this account formally banished from Athens. For more than twenty years he seems to have lived the life of a country gentleman at Scyllus in Elis, where he is supposed to have written most of his works. After the defeat of the Spartans at Leuctra (371 B.C.), Xenophon was driven from Elis, and is said to have retired to Corinth. He was certainly alive in 357 B.C. Xenophon's principal works, besides the *Anabasis*, are his *Cyropædia*, a political and educational romance based on the history of Cyrus the Great; the *Hellenica*, a history of Greece where Thucydides leaves off, from 411 to 362 B.C.; and the *Memorabilia*, recollections of Socrates.

XERES. See Jerez.

XERXES, I., King of Persia, famous for his unsuccessful attempt to conquer Greece, was the son of Darius and of Atossa, daughter of Cyrus. He began to reign 485 B.C., and continued his father's preparations for another Persian invasion of Greece. The army which he collected must on the soberest estimate have exceeded a million of men, with a fleet of 1200 sail. Xerxes crossed the Hellespont (480 B.C.), and met with no resistance until he reached the Pass of Thermopylæ. After Leonidas had fallen there with his Spartans, Xerxes pressed forward and burned Athens, which had been forsaken by almost all its inhabitants. He watched from the mainland the naval battle of Salamis (September, 480 B.C.), and fled ignominiously after the overwhelming defeat of his fleet. Xerxes was assassinated 465 B.C. He has been supposed to be the Ahasuerus of the Book of Esther.

XIMENES (hi-mā'nes), Francisco, Spanish cardinal, born in 1437, died in 1517. In 1492 he was appointed confessor to Queen Isabella of Castile, and in 1495 Archbishop of Toledo, distinguishing himself as a reformer of ecclesiastical and monastic abuses. In 1507 he was made a cardinal, and in 1509 he accompanied an expedition, fitted out at his own expense, which captured the Moorish city of Oran. In 1516 King Ferdinand died, leaving Ximenes regent during his grandson Charles's absence in the Netherlands.

In 1517 Charles returned to Spain,

and, prompted by jealousy of the power of Ximenes, dismissed him. Ximenes died almost immediately afterward. He founded and endowed the University of Alcala de Henares, and is said to have expended half a million of ducats on the famous Complutensian Polyglot.

X-RAYS, certain mysterious rays which emanate from a glass globe from which the air has been exhausted, and through which an electric charge is taking place. The rays were discovered in 1895 by Dr. Roentgen of Würzburg.

The most striking feature of X-rays at first sight is the fact that they penetrate with great ease certain substances which are opaque to light, and, on the other hand, are absorbed by certain substances which are very transparent to light. Thus the X-rays are absorbed largely by glass, but are transmitted most freely by aluminum, by wood, by human flesh, etc. It is owing to these facts that photographs may be obtained of many objects hidden from view, by allowing X-rays to cast a shadow picture of them on a photographic plate. In this manner photographs of the bones of the body, of metal objects contained in wooden boxes, etc., may easily be obtained.

When a careful study is made of the absorption produced in X-rays by various substances, it is found that there is a close connection between the intensity of absorption and the density of the absorbing body; and it is a general law that the greater the density of the body the greater is its absorptive power. This fact is of the utmost importance in the interpretation of photographs of portions of the human body and of other objects taken by the X-rays; the intensity on the photographic plate is in reality a measure of the density of the absorbing substance whose photograph is taken.

X-rays are observed to affect a photographic plate in the same manner as ordinary light, and this fact is made use of in nearly all applications of these rays. It was found also—in fact, it was the fundamental observation of Roentgen—that X-rays excite the fluorescent action of certain substances, so that when excited by the rays they emit light. A careful study has been made of various substances which are affected in this way, and certain of them are used in making so-called fluorescent screens, which may be used to receive the shadows cast by an X-ray tube instead of receiving them on a photographic plate.

Roentgen himself observed that if the X-rays were allowed to enter the eye of an observer who is situated in a room entirely dark, the retina of the eye received a stimulus and light was perceived. It is extremely probable that this is due to the fluorescent action of the X-rays on certain portions of the eye. It was observed, a few months after the discovery of the X-rays, that if the radiation is too intense its action on the skin of an observer might

produce most serious changes and cause what are known as "X-ray burns." X-ray pictures of parts of the body as

seen when photographed are due to the power of absorption of different substances of different amounts of the rays



The bones of the hand as shown by X-Rays.

in chemical composition, molecular grouping and thickness. When proficient the observer may recognize the presence and extent of tuberculosis, pneumonia, pleurisy, empyema, etc., and from the shortened excursion of the diaphragm the presence of bronchitis may be inferred. Much can be judged concerning the heart, and if displaced, by fluid or gas in the pleural cavities, pneumonia, pleurisy, tuberculosis, aneurism or tumor, or if it is attached or unusually placed or malformed, the condition may be ascertained by the X-ray examination. Aneurisms can be clearly defined when no other method is of service. All new growths as well as enlarged glands within the thorax may be diagnosed. Valuable information concerning the oesophagus, stomach, and other abdominal organs and viscera, the pelvic cavity, measurements of the uterus and extra-uterine pregnancy may be diagnosed. The X-ray is serviceable in the treatment of lupus, eczema, syphilitic lesions, nævus, syphilis, favus, acne, and psoriasis. In many cases of new growths, such as cancer, it has produced amelioration and actual cure. The Röntgen rays are used in surgery to detect the position or presence of foreign bodies, such as bullets, and to recognize fractures, and in cases of fracture it remains preëminent, both to confirm diagnosis and to decide if a fracture has been properly reduced, after it has been put into a retaining apparatus. The X-ray has added greatly to our knowledge of the human skeleton, especially of the joints.

Y

Y, the twenty-fifth letter of the English alphabet, was taken from the Latin, the Latin having borrowed it from the Greek **T** or **upsilon**. In modern English it is both a consonant and a vowel. At the beginning of syllables and followed by a vowel it is a consonant; in the middle of syllables and at the end of words it is a vowel.

YACHT (yöt), a light and elegantly fitted up vessel, propelled by either steam or sail, used for pleasure or racing. There are two distinct species of yacht—the mere racer, with enormous spars and sails and deeply-ballasted hull, with fine lines, but sacrificing everything to speed; and the elegant, commodious, well-proportioned traveling yacht, often with steam-propelling machinery, fit for a voyage round the world. A type of yacht much used in America is that with a center-board or sort of movable keel. The practice of yachting as well as the word yacht was derived from the Dutch. The word yacht is found in use in English in Elizabeth's time, and James I had a yacht built for his son Henry early in the 17th century, but it was not till long after that yachting became a favorite pastime with the rich. The pleasure ship is as old as Homer or older. One of the Ptolemys (300 B.C.) had nearly 1000 pleasure ships, some of which were 300 feet long. Modern yachts and yachting dates from 1588 in Britain with the building

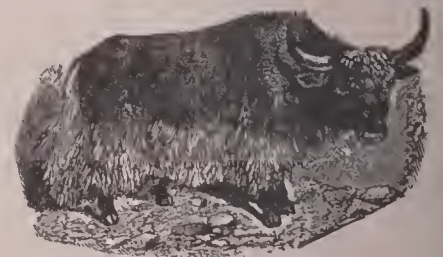
of the *Rat* at Cowes, in the Isle of Wight. The first recorded yacht race took place on the Thames in October, 1661. Yacht racing took on new life about 1843 when Queen Victoria began to encourage it by offering valuable cups for prizes. In 1844 the New York Yacht Club was organized and in 1851 it sent to England a specially built yacht, the *America*, to take part in the yacht races at Cowes. The prize was a silver cup valued at \$500, offered to all nations by the Royal Yacht Squadron, for a race around the Isle of Wight. The *America* won this cup against all nations and brought it back. In 1857 the owner of the *America* presented the cup to the New York Yacht Club to stand for all time as the symbol of the world's supremacy in yacht racing. The cup was thenceforward called "the America's cup." To get it back British yachtsmen are required to challenge the New York Yacht Club (or the United States, through that organization), and must send the challenger to American waters for the race. See *Shamrock I, II, III*.

The introduction of compound engines, with their economy of space and fuel, marks the real beginning of steam yachting, and since that time steam yachts have had a wonderful development.

The limit in this class was reached in the *Arrow*, built in 1900. She is 139.33

feet long and displaces 66 tons, with a record of 40 knots. She is fitted with quadruple-expansion engines that take steam at a pressure of 400 pounds from water-tube boilers.

YAK, a fine large species of ox, with cylindric horns, curving outward, long, pendent, silky hair fringing its sides, a bushy mane of fine hair, and long, silky, horse-like tail; inhabiting, both



Yak.

in the wild and the domesticated state, Tibet and the higher plateaus of the Himalayas; called grunniens (grunting) from its very peculiar voice, which sounds much like the grunt of a pig. It is the ordinary domestic animal of the inhabitants of those regions, supplying milk, food, and raiment, as well as being used as a beast of burden and to draw the plough. The tail of the yak is in great request for various ornamental purposes, and forms an important article of commerce.



The auxiliary clipper R. C. Rickmers. Length on deck, 441 feet. Beam, 53 feet 8 inches. Draft, loaded, 26 feet 9 inches. Carrying capacity, 8,000 tons. Displacement, 11,360 tons. Sails spread 50,000 square feet.



Latest styles in racing yachts.

YAKUTSK', a province of Eastern Siberia, includes nearly the whole of the basin of the Lena, between which river and its tributary, the Vitim, rich gold mines are worked. Area, 1,517,127 sq. miles. Pop. 243,450.

YALE UNIVERSITY, one of the oldest and largest of American universities, originally a collegiate school established at Saybrook, Connecticut, in 1701. It was removed in 1716 to New Haven, and soon after its name was changed to Yale college, after Elihu Yale (1649-1751), a native who had amassed a fortune in India, and was an early benefactor of the institution. It has four faculties or departments; philosophy, theology, law, and medicine, in all of which its governing body grants degrees. The first of these includes, besides the original academical or arts department of Yale college, a scientific and engineering school, a school of fine arts, and also post-graduate courses. The aggregate number of volumes in all the libraries of the university is over 500,000, of which 1000 were presented in 1730 by Bishop Berkeley. Its buildings are now very extensive, and its funds have greatly increased by private munificence. The teaching staff numbers nearly 400, and the total number of students is over 3,000.

YAM, a large esculent tuber or root produced by various plants growing in the warmer regions of both hemispheres. Yams, when roasted or boiled, form a wholesome, palatable, and nutritious food, and are extensively cultivated in many tropical and sub-tropical countries. The Chinese or Japanese yam contains more nitrogenous and therefore nutritive matter, but less starch, than potatoes. It is hardy in Great Britain and thrives in the United States, but its cultivation is impeded by the great depth to which its roots descend. The tubers of the West Indian yam, one of the species most widely diffused, sometimes attain a weight of 50 lbs.

YAMA, a Hindu god, the judge of the dead, whose good and bad actions are read to him out of a record, and who according to their merits and demerits are sent to the celestial or to the infernal regions. Hindus offer to him daily oblations of water.

YANG-TZE-KIANG, one of the two great rivers of China, is formed by two streams rising in Eastern Tibet, in lat. 26° 30' n., lon. 102° e., and after flowing east and then south enters the Chinese province of Yunnan. Pursuing a very tortuous course, much of it through most fertile and densely-populated regions, it reaches the great city of Nanking, 200 miles from the sea, where it widens gradually into the vast estuary which connects it with the Yellow sea. Its whole course, under various names, is 2900 miles, and the area of its basin is computed to be 548,000 sq. miles. It is connected by the Grand canal with the Hoang-ho or Yellow river, and is navigable for vessels of considerable draught for 1200 miles from its mouth. By the treaty of Tien-tsin the Lower Yang-tze was opened to European trade; and 700 miles from its mouth is the treaty-port of Hangkow, the great commercial port of Mid-China. The highest

port on the river at present reached by steamers is the treaty-port Ichang, 1000 miles from its mouth.

YANKEE, a cant name for Americans belonging to the New England states. During the American revolution the name was applied by the British to all the insurgents; and during the civil war it was the common designation of the federal soldiers by the confederates. In Britain the term is sometimes improperly applied generally to natives of the United States. The most common explanation of the term seems also the most plausible, namely, that it is a corrupt pronunciation of English or of French *Anglais* formerly current among the American Indians.

YANKEE-DOODLE, a famous air, now regarded as American and national. In reality the air is an old English one, called Nankey Doodle, and had some derisive reference to Cromwell. The really national tune of the whole United States, however, is "Hail, Columbia."

YARD, a British and American standard measure of length, equal to 3 feet or 36 inches, the foot in general being made practically the unit. As a cloth measure the yard is divided into 4 quarters = 16 nails. A square yard contains 9 square feet, and a cubic yard 27 cubic feet. See Weights and Measures.

YARD, in ships, a long cylindrical piece of timber, having a rounded taper toward each end, slung crosswise to a mast. All yards are either square or lateen, the former being suspended across the masts at right angles for spreading square sails, the latter obliquely. Yards have sheave-holes near their extremities for the sheets reeving through. Either end of a yard, or rather that part of it which is outside the sheave-hole, is called the yard-arm.

YARKAND', the chief town of the principal oasis of Chinese Turkestan, is situated on the river Yarkand. The inhabitants, chiefly Persians, are keen traders. Pop. about 60,000.—The river rises in the Karakorum mountains, and helps to form the river Tarim, which enters Lob Nor.

YARMOUTH, or, as it is more strictly called, Great Yarmouth, an English seaport, important fishing-station, watering-place, and municipal, parl., and county borough, in the county of Norfolk, 20 miles east of Norwich. It is the great seat of the English herring and mackerel fishery, and also furnishes large quantities of white-fish. The curing of herring as "Yarmouth bloaters" is an important industry. The coast is dangerous, but Yarmouth roads, between the shore and a range of sandbanks, offers a safe anchorage. Pop. 51,250.

YARN, any textile fiber prepared for weaving into cloth. See Thread.

YARRELL, William, an eminent naturalist, was born in London 1784, died 1856. His two works, the *History of British Fishes* and the *History of British Birds* are standard authorities.

YATES, Richard, war governor of Illinois, was born in Warsaw, Ky., in 1818. He was thirteen years of age when his family moved to Illinois. He graduated at Illinois college, Jacksonville, studied law, and practiced in Springfield. Elected to the state legislature in

1842, he was sent to congress in 1850, being the youngest member of that body. He was elected governor in 1860, and again in 1862. He was an outspoken opponent of slavery, and was very active in raising volunteers. It was in Gov. Yates's office that Ulysses S. Grant received his first distinct recognition as a soldier. Gov. Yates was elected United States senator and served one term, from 1865 to 1871. He died in 1873. His son, Richard, Jr., was elected governor of Illinois in 1900.

YATAGHAN, a sort of dagger-like saber with double-curved blade, about 2 feet long, the handle without a cross-guard, much worn in Mohammedan countries.

YAWL, a small ship's boat, usually rowed by four or six oars; a jolly-boat; also a sailing boat similar to a cutter, but having a small sail at the stern.

YAWNING, an involuntary opening of the mouth, generally produced by weariness, tedium, or an inclination to sleep, sometimes by hunger, etc. When yawning is troublesome, long, deep respiration, or drawing in the air at long intervals, relieves it.

YAWS, a disease occurring in America, Africa, and the West Indies, and almost entirely confined to the African races. It is characterized by cutaneous tumors, numerous and successive, gradually increasing from specks to the size of a raspberry, one at length growing larger than the rest; core a fungous excrescence; fever slight, and probably irritative merely. It is contagious, and cannot be communicated except by the actual contact of yaw matter to some abraded surface, or by inoculation, which is sometimes affected by flies.

YAZOO RIVER, a river of the United States, 290 miles long, navigable throughout its course, which is entirely in the state of Mississippi, joining the Mississippi river 12 miles above Vicksburg.

YEAR, the period of time during which the earth makes one complete revolution in its orbit, or the period which elapses between the sun's leaving either equinoctial point, or either tropic, and his return to the same. This is the tropical or solar year, and the year in the strict and proper sense of the word. This period comprehends what are called the twelve calendar months, and is usually calculated to commence on 1st January and to end on 31st December. It is not quite uniform, but its mean length is about 365 days, 5 hours, 48 minutes, and 51.6 seconds. In popular usage, however, the year consists of 365 days, and every fourth year of 366.—Lunar year, a period consisting of 12 lunar months. The lunar astronomical year consists of 12 lunar synodical months, or 354 days, 8 hours, 48 minutes, 36 seconds. The common lunar year consists of 12 lunar civil months, or 354 days. The embolismic or intercalary lunar year consists of 13 lunar civil months, and contains 384 days.—

YEAST, the yellowish substance, having an acid reaction, produced during the vinous fermentation of saccharine fluids, rising to the surface, when the temperature of the fluid is high, in the form of a frothy, flocculent, viscid

matter (surface yeast), and falling to the bottom (sediment yeast) when the temperature is low. The ordinary yeast of beer consists of an immense number of minute cells, which constitute a plant called the yeast-plant, which multiplies by budding off other cells, or sometimes by spores. Little is known regarding the genesis of the yeast-plant. Pasteur's researches seem to show that the yeast which forms in grape juice is derived chiefly from certain germs abounding about harvest-time on the grapes, and diffused throughout the atmosphere of breweries and wine-cellars, etc. Yeast is not only generally essential to the production of wine from grape and other fruit juices, and to the manufacture of beer, but it is also an agent in producing the fermentation whereby bread is rendered light, porous, and spongy.

YEDDO. See Tokio.

YELLOW, one of the prismatic colors; the color of that part of the solar spectrum situated between the orange and the green; a bright golden color, the type of which may be found in the field buttercup, which is a pure yellow. United with blue it yields green; with red it produces orange. See Color and Spectrum.

YELLOW-BIRD, a small singing bird common in the United States. The summer dress of the male is of a lemon yellow, with the wings, tail, and fore part of the head black. When caged the song of this bird greatly resembles that of the canary.

YELLOW-FEVER, popularly known as Yellow Jack, a malignant febrile disease, indigenous chiefly to the West Indies, northern coasts of South America, the borders of the Gulf of Mexico, and the Southern United States. It is attended with yellowness of the skin, of some shade between lemon-yellow and the deepest orange-yellow. The symptoms may appear within one or two days after the poison has entered the person's body, or may not occur for six or ten. The attack is sudden, beginning with shivering, headache, pain in the back and limbs, with fever. It is most fatal from May to August; is very contagious, but a sufferer from one attack is nearly safe from a second. It has occasionally appeared in Europe, but does not spread; cold weather kills it.

YELLOW-HAMMER, yellow-hammer, a passerine bird called also yellow-bunting. The head, cheeks, front of the neck, belly, and lower tail-coverts are of a bright yellow; the upper surface is partly yellow, but chiefly brown, the feathers on the top of the back being blackish in the middle, and the tail feathers are also blackish. The yellow-hammer is a resident in Britain, and generally throughout Europe.

YELLOW-PINE, a North American tree, *Pinus mitis* or *variabilis*. The wood is universally employed in the countries where it grows for domestic purposes, and is also extensively exported to Britain, and elsewhere.

YELLOW RIVER. See Hoang-ho.

YELLOW, an inflammation of the liver, or a kind of jaundice which affects horses, cattle, and sheep, causing yellowness of the eyes.

YELLOW SEA, an arm of the Pacific ocean, on the northeast coast of China; length, about 620 miles; greatest breadth about 400 miles. It is very shallow, and obtains its name from the lemon-yellow color of its water near the land, caused by mud suspended in the water from the inflow of the rivers Hoang-ho and Yang-tse-kiang.



Yellow hammer.

YELLOWSTONE NATIONAL PARK, a region mainly in Wyoming, United States, which in 1872 was withdrawn from settlement by the United States government to become a park or tract for the recreation of the people. Its area is 3312 sq. miles; its length north and south 61 miles, and its breadth 53. It is accessible by a branch of the Northern Pacific railway. Its surface is mainly an undulating plain, diversified, however, by great mountain ranges, one of which, the Absaroka, a range separating the waters of the Yellowstone river from those of the Big Horn, contains



The great geyser basin of the upper Yellowstone.

some of the grandest scenery in the United States. The whole region exhibits an endless variety of wild volcanic scenery—hot springs, mud volcanoes, geysers, cañons, waterfalls, etc. The geysers are more remarkable than those of Iceland, and the Grand Geyser in

Firehole basin is the most magnificent natural fountain in the world. The Yellowstone lake, one of many, is a magnificent sheet of water, with an area of 150 sq. miles. A large part of the park is covered with forests. Stringent legislation protects the game, with the result that elk, deer, antelope, bear, and bison have taken refuge in it.

YELLOWSTONE RIVER, a river of the United States, which rises in the Rocky mountains, about lat. 44° n. and lon. 110° w. After a course of about 25 miles it passes through the lake of the same name, and runs northward through the Yellowstone National park. Soon after issuing from the lake the river makes at intervals a series of falls (the last being 300 feet high), and traverses cañons, one of which, the Great Cañon, is 30 miles in length, its steep sides being colored in bright hues and shaped in great variety of fantastic forms. Running in a northeasterly direction the river ultimately joins the Missouri about lat. 48° n., after a course of some 1100 miles. Steamers can ascend it for 300 miles to the mouth of the Big Horn, which is its largest affluent.

YELLOW-THROAT, a small North American singing bird.

YEMEN, a division of Arabia, occupying the southwest angle of the peninsula, and known as Arabia Felix. Estimated area, 70,000 sq. miles; estimated population, about 600,000. The chief potentate is the Imám of Sana, a tributary of Turkey.

YEN, Japanese money of account, equivalent to 98c.

YENIKALE, Strait of, connecting the Black sea with the Sea of Azof, is about 20 miles long, and in some parts only 2 miles broad and 2 fathoms deep.

YENISEI (yen'i-si), a great river of Asia, rises in Mongolia, flows northward through Siberia, and after a course of

about 2,500 miles enters the bay of the same name in the Arctic ocean.

YENISEISK, a vast province of Eastern Siberia, extending from the Chinese frontier to the Arctic ocean; area, 992,870 sq. miles. It contains rich auriferous deposits. Pop. 559,902.—

The capital, of the same name, is the chief entrepôt for the gold mines of the province and the Siberian fur-trade. Pop. 7050.

YER'KES, Charles Tyson, American capitalist, was born in Philadelphia, Pa., in 1837. From 1861 to 1886 he was in the banking business, making a specialty of dealing in bonds. In 1886 he secured virtual control of the street and elevated railway systems of Chicago. In 1892-93 he was an influential member of the board of directors of the World's Fair in Chicago. In 1892 he endowed the famous Yerkes observatory, which was completed in 1896. He took an active part in the construction and extension of the new London (Eng.) underground railway system. He died in 1905.

YERKES OBSERVATORY, the astronomical observatory of the University of Chicago, located at William Bay, Wis. It is named after its founder, Charles Tyson Yerkes, who supplied the funds for buildings and instruments. This institution contains the largest refracting telescope in existence. It is of 40 inches diameter. It is used principally for the observation of close or faint double stars, the planets and satellites, and spectroscopic work.

YESSO, YEZO, or JESSO, the most northerly of the larger Japan islands, has an area of about 35,000 sq. miles, and a pop. of 610,155, including a number of Ainos, a docile aboriginal race. The island is mountainous and volcanic, and is rich in minerals, including coal, gold and silver. Matsmai and Hakodadi are the chief towns.

YEW, an evergreen tree of the genus *Taxus*, indigenous in most parts of Europe. It is a handsome tree, growing to a height of from 30 to 40 feet, with numerous spreading branches, forming a dense head of foliage. Its trunk is thick, and has been known to attain a circumference of 56 feet. Its fruit is a red berry with green seeds. It used to be frequently planted in church yards, and its tough elastic wood was extensively used in the manufacture of bows. In



Yew.

our own days, on account of the durability of the timber, and of its hard, compact, close grain, it is much used by cabinet-makers and turners. There are several varieties of it, the Irish yew, which has a more upright growth than the common yew, being esteemed the finest. The American yew is a low prostrate shrub, never forming an erect trunk. It is found in Canada, and the more northern of the United States, and is commonly called ground-hemlock.

YEZD, a city of Persia, province of Faristan, in an oasis in a sandy plain 190 miles southeast of Ispahan. It is noted for its velvet and other silk manufactures, and contains about 4000 fire-worshippers. Pop. about 50,000.

YOKOHA'MA is the most important of the Japanese ports opened by treaty to foreigners, from its proximity to Tokio, the capital of the empire, with which it is connected by a railway 18 miles in length. The foreign settlement consists of well-constructed streets with business establishments. The harbor, a part of the bay of Tokio, is good and commodious, and is much frequented by Japanese and other steamers. Pop. 187,200.

YONGE (yong), Charlotte Mary, English authoress, born at Otterborne, Hants, 1823. Her writings are very numerous, and include the well-known stories *The Heir of Redclyffe*, *The Little Duke*, *Dynevor Terrace*, *The Daisy Chain*, etc. She has published a work on *Christian Names*, *A Life of Bishop Patteson*, and numerous historical works for the young, including her *Cameos from English History*. She died in 1901.

YONKERS, a town in New York state, on the east bank of the Hudson, 16 miles by railway north of New York City, many of the merchants of which own handsome residences in it. There are manufactures of felt hats, silk, reapers and mowers, carpets, pencils, etc. Pop. 1909 estimated at 73,000.

YONNE, a department of Central France, traversed by the river Yonne, which is navigable throughout it. The granite mountains in the southeast attain a height of 2000 feet. The soil is very fertile, producing large wheat crops, and the vines yield the finest red wines of Lower Burgundy, and the finest of white wines, the well-known Chablis. Auxerre is the capital. Area, 183,475 acres. Pop. 316,047.

YORK, the largest county of England, is bounded on the north by the Tees, separating it from Durham, east by the North sea, south by Lincoln, Nottingham, Derby, and Chester, and west by Chester, Lancaster, and Westmoreland; area, 3,882,848 acres or nearly 6067 sq. miles. Total pop. 3,585,122. In the North is the capital of the whole county, York; Scarborough, a favorite watering-place; and Whitby, famous for its jet. In the East the area under cultivation greatly exceeds that laid down in permanent pasture. Its industrial activity is centered in the great seaport of Hull. In the West the proportion of land laid down in permanent pasture is larger than in any other, being two-thirds of that under cultivation. Leeds produces every variety of woolen goods; Bradford, mixed worsted fabrics and yarns; Dewsbury, Batley, and adjoining districts, shoddy; Huddersfield, plain goods, with fancy trouserings and coatings; and Halifax, worsted and carpets. Barnsley is famous for its linen manufactures, of which Leeds also is a seat, as well as of that of leather. Next to the woolen and other textile industries comes the manufacture of iron and steel machinery, and implements of every description. Leeds is one of the principal seats of all kinds of mechani-

cal engineering, and Sheffield of iron-work and cutlery.

YORK, a cathedral city and archbishop's see, a municipal, county, and parl. borough, and capital of Yorkshire, 188 miles north of London by rail, is situated at the confluence of the Foss and the Ouse. The great object of attraction is the minster or cathedral, the finest in England, which dates from the 7th century, but did not begin to assume its present form till the 12th century, and was not completed till 1472. It is built in the form of a Latin cross with choir, aisles, transepts, a central tower and two western towers; extreme length, 524 feet; breadth, 250; height of central tower, 213 feet. Pop. 77,793.

YORK, capital of York county, Pennsylvania, has historical interest attached to it from the fact that for nearly a year (1777-78) it was the place of meeting of the continental congress. It possesses foundries, manufactories of agricultural implements, etc. Pop. 39,048.

YORK, House of, an English royal house, the rival of that of Lancaster. The House of York was united to the House of Lancaster when Henry VII. married the eldest daughter of Edward IV. The emblem of the Yorkists was a white rose.

YORKTOWN, capital of York county, Virginia, United States, on the right bank of York river, nearly 10 miles from its mouth, was the scene of the surrender of Lord Cornwallis to General Washington, October 19, 1781. In the civil war it was fortified by the confederates, who, having been besieged by General M'Clellan, evacuated it May 4, 1862. Pop. about 1000.

YO-SEMITE (sem'i-te), **VALLEY**, one of the greatest natural wonders of North America, is in Mariposa county, California, about 140 miles southeast of San Francisco and midway between the eastern and western bases of the Sierra Nevada. It is a narrow valley at an elevation of 4000 feet above the sea and is itself nearly level, about 6 miles in length, and varying in width from $\frac{1}{2}$ mile to a mile. On each side rise enormous domes and almost vertical cliffs of granite, one of them called the Half Dome being 4737 feet higher than the river Merced at its base, while the more important waterfalls are the Yosemite and the Bridal Veil. This valley has been added by congress to the state of California, on condition that it shall be kept as a public park or free domain "inalienable for all time."

YOUNG, Brigham, president of the Mormon church, was born in 1801 in the state of Vermont, United States. In 1831 he became a Mormon, and an active preacher of the Mormon doctrine. He was one of the twelve founders of Nauvoo, and after the murder of the prophet, Joseph Smith, and the flight of the Mormons from Nauvoo, Young became their leader, was elected their president on their settling in Utah, and when this was made a territory he was appointed its governor by President Polk. In 1852 he announced that polygamy had been commanded in a special revelation to Joseph Smith, and it was accepted generally by the Mormons of Utah. Young was a man of

great practical ability. Utah flourished under his rule, and he long withstood successfully the efforts of the United States government to establish its authority there. He died in 1877.

YOUNG, Edward, English poet, was the son of a dean of Salisbury, and born in 1681. His first great literary success was his production of a series of satires, issued collectively in 1728 as *The Love of Fame, the Universal Passion*. Between 1742 and 1744 appeared the work by which chiefly he is remembered, the gloomy but striking *Night Thoughts*. He died in 1765.

YOUNG, James, an eminent practical chemist, was born at Glasgow in 1811, and died in 1883. Receiving appointments in chemical works at St. Helen's and Manchester, he discovered a method of distilling oil from shale, through which he became the founder of the mineral oil industry of Scotland, besides leading to the development of the petroleum industry in America and elsewhere.

YOUNG, Thomas, M. D., scientist, born of a Quaker family at Milverton in Somersetshire, in 1773. In 1802 he became the colleague of Davy as professor of natural philosophy at the Royal institution, having previously made the discovery of the interference of light, the result of researches which, completed by Fresnel, secured the triumph of the undulatory theory. In 1807 appeared his admirable *Lectures on Natural Philosophy*. Young preceded Champollion in the discovery of the alphabetic character of certain of the Egyptian hieroglyphs. He died in 1829.

YOUNG, Samuel Baldwin Marks, American soldier, was born in Pittsburgh, Pa., in 1840. He served throughout the civil war, attained the rank of colonel in December, 1864, and in April, 1865, was brevetted brigadier-general of volunteers. He attained the rank of colonel of the Third Cavalry in 1897, and in 1898 was made a brigadier-general of volunteers for service in the Spanish-American war. He served under General Shafter in the early part of the Santiago campaign, was promoted to the rank of major-general of volunteers in 1898, and for a time commanded the Second Army Corps. From July, 1899, to March, 1901, he served in the Philippines, was military governor of Northwestern Luzon and commander of the first district of the department of Northern Luzon. In 1903, on the retirement of General Miles, he was promoted to the rank of lieutenant-general. When the new general staff system went into effect in 1903 he became chief of staff of the army.

YOUNG MEN'S CHRISTIAN ASSOCIATIONS, among the first of these was that founded in London in 1844 by Sir George Williams. Its object was the holding of religious meetings in business houses in the center of London. The movement extended, and became one not only for the religious but for the general culture and social well-being of young men engaged in business. The

young men's Christian associations, all of which are self-governing while forming an organized union, are now nearly 8000 in number, with a total membership of about one million, the centers being scattered over the world. In the United Kingdom there are about 100,000 members. In the United States there are nearly 2000 associations with a membership of about 450,000.

YOUNG WOMEN'S CHRISTIAN ASSOCIATION, THE WORLD'S, the World's Young Women's Christian Association was formed in 1894. Eleven National associations are now affiliated: Great Britain, United States, Canada, Germany, Italy, France, Norway, Sweden, India, Denmark, and Hungary. The executive committee is composed of a resident membership in London and two representatives from America and other countries. The second World's conference was held in Geneva, Switzerland July, 1902. The American committee was formed in 1886. There are now associations affiliated with the American committee in 552 colleges and 104 cities, with 24 state organizations. Membership of local associations connected with the American committee, 100,252.

YOUNGSTOWN, town in Mahoning county, Ohio, on the Mahoning river 66 miles southeast of Cleveland, in the vicinity of iron ore and coal beds; has rolling-mills, blast-furnaces, and manufactures of machinery, etc. Pop. 52,340.

YPSILANTI, a distinguished Greek family claiming to be descended from the Comneni. Demetrius, born in 1793, entered the Russian service, and joining the Greeks in their war of independence distinguished himself so highly as to be made commander-in-chief of the Greek army after the liberation of Greece from the Ottoman yoke. He died in 1832.

YPSILANTI, a city in Washtenaw co., Mich., 29 miles west by south of Detroit, on the Huron river, and on the Michigan Central and the Lake Shore and Michigan Southern railroads. It is also connected by electric lines with Ann Arbor and Detroit. Population 10,000.

YTTRIA (it'ri-a), the protoxide of yttrium, a white powder, insoluble in water, but soluble in some acids. When ignited it glows with a pure white light.

YTTRIUM (it'ri-um), an earth metal, one of the elements, the basis of yttria; symbol Y, atomic weight 93. Its texture is scaly, and its color grayish-black.

YUCATAN, a peninsula forming the southeastern extremity of Mexico. Before its conquest by the Spaniards it was the seat of a flourishing civilization. It is now for the most part a sparsely cultivated region, whose forests yield excellent timber, cabinet-woods and dye-woods, and which has recently been productive of great quantities of sisal or so-called Yucatan hemp. Five-sixths of the inhabitants are Indians, preserving the speech of their ancestors, whom the Spaniards dispossessed. In 1861 the peninsula, which since 1824 had formed

one state in the Mexican confederation, was divided into two: Yucatan, area 29,560 sq. miles, pop. 302,500, capital Merida; and Campeachy, area 25,830 sq. miles, pop. 90,500, capital Campeachy.

YUCCA, a genus of American plants. The species are handsome plants, with white flowers, extremely elegant, but destitute of odor.

YUKON GOLD FIELDS, See Klondike.

YUKON RIVER, a river of Alaska, is formed by the junction of the Lewis and Pelly at Port Selkirk, and flows westward across the territory of Alaska into Bering sea. Its length is some 2000 miles, being one of the largest rivers in North America. In its lower course it is more than 20 miles wide, and throughout it is navigable, at least for small boats. But the deposits of mud and silt where it finally reaches the sea have formed a great delta which renders its lower course unfit for navigation, and prevents vessels at sea from approaching within 60 miles of its many mouths. During three months of the year its waters swarm with salmon, some 80 to 120 lbs., and 5 to 6 feet long. These fish ascend the river for 1200 to 1500 miles. The water from this river flows with such force and volume that the water is fresh ten miles out from the mouth.



Yucca.

YULE, the old English and Scandinavian name for Christmas, still to some extent in use, as in the term yule-log.

YUNNAN, the most southwesterly province of China, is bounded on the south by Annam, Siam, and Burmah, and on the west by Burmah. It is extremely rich in minerals, especially iron and copper, containing also many varieties of precious stones. At least a third of the cultivated land is said to be under the poppy. By the convention of Chefoo in 1876 the establishment of commercial relations between British subjects and Yunnan was conceded by the Chinese government. Estimated area, 122,500 sq. miles; estimated pop. 12,000,000.—Yunnan, the capital, is situated in the southeast, and is a busy and prosperous town, with large copper factories, and manufactures of silks and carpets. Pop. 200,000.

Z

Z, the last letter of the English alphabet, is a sibilant consonant, and is merely a vocal or sonant S, having precisely the same sound that s has in wise, ease, please, etc. (See S.) The words in modern English which begin with z are all derived from other languages, mostly from the Greek. When not initial however, we often find it representing an older s in genuine English words, as in blaze, freeze, gaze, graze, etc.

ZACATECAS, state of Mexico, belonging to the central table-land, and bounded by the states of Aguascalientes, Jalisco, Durango, Coahuila, Nuevo-Leon, and San Luis Potosi. It is very rich in gold and silver, which are extensively mined. Area, 25,227 sq. miles. Pop. 422,506.—Zacatecas, the capital, 340 miles northwest of Mexico, is the center of one of the oldest and most productive silver-mining districts in the republic. Pop. 46,000.

ZAMBEZI, the most important river in Southeastern Africa, and the largest flowing into the Indian ocean, has its source in several streams uniting in the far interior. It flows first southeast and then northeast, then curves again to the southeast, and reaches the Indian ocean by several mouths in the Mozambique channel opposite Madagascar. The delta of the Zambesi covers an area of about 25,000 sq. miles, and commences about 90 miles from the coast, a little below the confluence of the main stream with the Shiré. The course of the whole river is about 1600 miles, and it drains an area of 600,000 sq. miles. Its course as a whole is through fertile valleys and wooded plains; but the navigation is interrupted by rapids and cataracts, among the latter being the Victoria falls, which are among the grandest in the world. The navigation of the Zambesi is now free to vessels of all nations.

ZAMIA, a genus of plants found in tropical America, at the Cape of Good Hope, and in Australia, and partly resemble palms, partly tree-ferns. Kaffir-bread is a common name for the genus in South Africa, where the central part of the stem pith is formed into cakes, baked, and eaten by the natives.

ZANESVILLE, the county town of Muskingum county, Ohio, situated on the Muskingum river, 37 miles south of Cleveland; has rolling-mills, machine-shops, cotton and woolen factories, glass-works, etc. Pop. 28,000.

ZANGWILL, Israel, a British novelist and man of letters, was born in London, England in 1864. He traveled on lecturing tours in Ireland, Holland, Palestine, and the United States. Among his publications are: *Children of the Ghetto*, *Ghetto Tragedies*, *The King of Schnorrers*, *grotesques and fantasies*, including "A Rose of the Ghetto," *Dreamers of the Ghetto*, containing admirable sketches of great Jewish thinkers, as Spinoza and Lassalle; *They that Walk in Darkness*, and *The Mantle of Elijah*. Dramatized by the author in 1899. *The Children of the Ghetto* had a popular reception in New York and London. *The Big Bow Mystery*, *Merely Mary*

Ann, *The Grey Wig*. He also wrote a considerable amount of verse.

ZANZIBAR, a sultanate of East Africa, which formerly comprised the whole coast between Magdishu (Mogadodo), about lat. 2° n., and Cape Delgado, lat. 10° 42' s., with the four islands of Zanzibar, Pemba, Lamu, and Mafia. The continental part of the sultanate has recently become part of British East Africa and German East Africa; while the island and town of Zanzibar, and the island of Pemba, are entirely under British protection. The island (area, 600 sq. miles) is very fertile and well cultivated, being especially suited for the cultivation of cloves, sugar, coffee, cocoa, and various spices, of which there is a considerable export. The population (200,000) is extremely heterogeneous, including Europeans, Arabs, half-caste Portuguese from the Malabar coast of India, and the Suahilis from the mainland.—Zanzibar, the chief town (100,000 inhabitants), on the west side of the island, is the center of trade for the eastern seaboard of Africa, and of missionary and exploring work for the interior. At the instance of the British government the slave-trade has been abolished and slavery brought to an end.

ZEALAND, or **SEELAND**, the largest of the Danish islands, separated from Sweden by the Sound and from Funen by the Great Belt; length, 81 miles, breadth, 65. It produces large crops of corn, and has excellent pasture. It contains the capital of Denmark, Copenhagen. It is the most westerly province of Holland, has the greater part of its surface below the sea-level, and protected by dikes. The soil is fertile, producing rich crops of wheat, flax, and hemp, and much dairy produce is exported. The capital is Middleburg. Area, 689 sq. miles; pop. 198,567.

ZEBRA, a quadruped of Southern Africa, nearly as large as a horse, white, striped with numerous brownish-black bands on the head, trunk, and legs, except on the belly and inside of the thighs. The zebra is extremely difficult



Zebra.

to approach, from its watchful habits and great swiftness of foot. Only in a few instances has it been domesticated. The name has been sometimes applied to the now extinct quagga and the dauw or Burchell's zebra; but they differ from the zebra in having no stripes on

the lower limbs, while those on the body are not so black as the true zebra's. The zebra is said to be nearly extinct.

ZEBU, a ruminant of the ox tribe, called also Brahman bull. This quadruped differs from the common ox in having one, or more rarely two, humps of fat on the shoulders, and in having eighteen caudal vertebrae instead of twenty-one. It is found extensively in India, and also in China, Japan, and Africa. Zebras are used as beasts of draught and burden, and occasionally for riding. Their flesh is eaten as an article of food, especially the hump, which is esteemed a great delicacy.

ZEBU. See Cebu.



Zebu.

ZEBULUN, was the tenth son of Jacob, and gave his name to one of the twelve tribes of Israel, and to a region of Palestine. At the first census the tribe numbered 57,400, and 60,500 at the second. The territory of the tribe lay in the fertile hilly country to the north of the plain of Jezreel, and included Nazareth.

ZECHARIAH, or **ZACHARIAH**, the eleventh of the minor prophets, is supposed to have been born in Babylon, and to have been in the first detachment of the exiles who returned to Jerusalem under Zerubbabel and Joshua. He began to prophesy in the second year of Darius Hystaspes, and with his senior contemporary, the prophet Haggai, contributed powerfully by his appeals to the rebuilding of the temple (Ezra vi. 14). Chapters i.-viii. of the prophecies of Zachariah are generally admitted to be his composition. But the two other sections of the book into which critics and commentators have divided it, chapters ix.-xi. and xii.-xiii., have been ascribed by many to a pre-exilic author, partly because both what is said and is not said in them is regarded as irreconcilable with a post-exilic one.

ZEDEKIAH, the last king of Judah of the line of David. When he was twenty-one years of age Nebuchadnezzar appointed him to succeed his nephew Jehoiachim (whom he carried to Babylon) as king of Judah. He took an oath of allegiance to Nebuchadnezzar, which he afterward broke by entering into an alliance with Egypt. His conduct in so doing was denounced by the prophet Jeremiah, who, as well as Ezekiel, then in Chaldaea, predicted the

approaching fall of Jerusalem, which was besieged by Nebuchadnezzar and taken, B.C. 588. Zedekiah, whose sons were killed in his presence, had his eyes put out, and was carried to Babylon, where probably he died.

ZED'OARY, a plant distinguished, like ginger, for the stimulating and aromatic properties of the root. It is a native of India and China. The roots of several other species are sold under the same name.

ZENA'NA, the name given to the portion of a house reserved exclusively for the females belonging to a family of good caste in India.

ZEND, an ancient Iranian language, in which are composed the sacred writings of the Zoroastrians. It is a member of the Aryan family of languages, and very closely allied to Sanskrit.

ZEND-AVESTA, the collective name for the sacred writings of the Guebers or Parsees, ascribed to Zoroaster, and revered as a bible, prayer-book, and sole rule of faith and practice. It consists of several divisions, of which the oldest is written in the primitive Zend language. This partly consists of gâthâs or songs, some of which may contain the actual words of Zoroaster, and are valuable as containing the doctrines he taught. An English translation of the Zend-Avesta has been published.

ZENITH, the vertical point of the heavens at any place, that is, the point right above a spectator's head, and from which a line drawn perpendicular to the plane of the horizon would, if produced, pass through the earth's center, supposing the earth a perfect sphere. Each point on the surface of the earth has therefore its corresponding zenith. The opposite pole of the celestial horizon is termed the nadir. (See Nadir.) The zenith distance of a heavenly body is the arc intercepted between the body and the zenith, being the same as the co-altitude of the body.

ZENO, was emperor of the East from 474 to 491 A.D. One of the chief events of his reign, which was full of vicissitudes, was the permission given by him to Theodoric to dethrone Odoacer, which led to the establishment of the Ostrogothic kingdom in Italy.

ZENO, of Citium, in Cyprus, where he was born, founder of the Stoic school of philosophy, flourished in the first half of the 3d century B.C. Settling in Athens he attached himself to various philosophical sects in succession, until he instituted a doctrine of his own. He taught in the Stoa, a porch adorned with the pictures of Polygnatus, whence his followers were called Stoics, and were sometimes designated "disciples of the porch." His writings are all lost. In his ethical system the nature of moral obligation was recognized as unconditional, virtue as the only good, and vice, not pain, as the only evil. Developed by his successors, Stoicism became the creed of the noblest of the Romans until Christianity was generally accepted. (See Stoics.) The date of his death is uncertain.

ZENO'BIA, Queen of Palmyra, was the wife of its king Odenathus, and accompanied him both in war and in the

chase. Gallienus, in return for his services, acknowledged Odenathus as emperor, and when her husband was murdered, 267 A.D., she assumed the sovereignty, conquered Egypt, and called herself Queen of the East. Her ambition provoked the emperor Aurelian to make war on her, and after a stubborn resistance she fell into his power (273 A.D.), and was made to grace his triumph. She was allowed to pass the remainder of her life as a Roman matron. Zenobia was a woman of great courage, beauty, and linguistic accomplishments, and her studies were directed by Longinus.

ZEOLITE (zē'ō-līt), a generic name of a number of minerals which fuse under the blowpipe. They are hydrated double silicates, of which the principal bases are aluminium and calcium.

ZEPHYR, Zephyrus (zef'ēr, zef'i-rus), the west wind; and poetically, any soft, mild, gentle breeze. The poets personify Zephyrus, and make him the most mild and gentle of all the sylvan deities.

ZERE'BA, Zareeba, a word which came into notice in 1884 during British military operations in the Soudan, to denote an inclosure, the sides of which are protected by prickly brushwood from a sudden surprise of the enemy; a fenced encampment.

ZERO, in physics, any convenient point with reference to which quantitatively estimable phenomena of the same kind are compared; such as the point of a graduated instrument at which its scale commences; the neutral point between any ascending and descending scale or series, generally represented by the mark 0. In thermometers the zero of the centigrade and Réaumur scales is the freezing-point of water; in Fahrenheit's scale, 32° below the freezing-point of water. (See Thermometer.) Absolute zero is -273° C., or 273° C. below the freezing point of water, at which temperature any given body is supposed to contain no heat.

ZETLAND. See Shetland.

ZEUGLON (zū'glo-don), an extinct genus of marine mammals, regarded by Huxley as intermediate between the true cetaceans and the carnivorous seals. They belong to the Eocene and Miocene, one species of the Middle Eocene of the United States attained a length of 70 feet.

ZEUS (zūs), in mythology, the supreme divinity among the Greeks; the ruler of the other gods; generally treated as the equivalent of the Roman Jupiter. He was the son of Cronos and Rhea, brother of Poseidon (Neptune) and Hera (Juno), the latter of whom was also his wife. He expelled his father and the dynasty of the Titans, successfully opposed the attacks of the giants and the conspiracies of the other gods, and became chief power in heaven and earth. See Jupiter.

ZEÜSS (tsois), Johann Kaspar, born 1806, died 1856, a native of Bavaria, may be said to have founded Celtic philology with the publication in 1853 of his great work the *Grammatica Celtica*. In his later years he was a professor at the Bamberg Lyceum.

ZIBET, Zibeth (zib'et), an animal of the same genus as the civet-cat. It is

found in Eastern Asia, and in some of the larger islands of the Indian archipelago. It secretes an odiferous substance which resembles that of the civet. It is often tamed by the natives of the countries where it is found, and it inhabits their houses like a domestic cat.

ZILLEH, a town of northeastern Asia Minor, 39 miles southwest of Tokat; with some manufactures, and an annual fair attended by from 40,000 to 50,000 persons. Pop. 15,000.

ZINC, a metal, frequently called spelter in commerce; atomic weight 65. It has a strong metallic luster and a bluish-white color. Its texture is lamellated and crystalline, and its specific gravity about 7. It is hard, being acted on by the file with difficulty, and its toughness is such as to require considerable force to break it when the mass is large. At low or high degrees of heat it is brittle, but between 250° and 300° F. it is both malleable and ductile, and may be rolled or hammered into sheets of considerable thinness and drawn into wire. Its malleability is considerably diminished by the impurities which the zinc of commerce contains. It fuses at 773° F., and when slowly cooled crystallizes in four or six-sided prisms. Zinc undergoes little change by the action of air and moisture. When fused in open vessels it absorbs oxygen, and forms the white oxide called flowers of zinc. Heated strongly in air it takes fire and burns with a beautiful white light, forming oxide of zinc. Zinc is found in considerable abundance in Britain, Austria, Germany, Belgium, Italy, etc. It does not occur in the native state, but is obtained from its ores, which are chiefly the sulphide, or zinc-blende, and the carbonate, or calamine. It has been reported native in small quantities in northeastern Alabama but this discovery needs further confirmation. The oxide of zinc is a fine white powder, insoluble in water, but very soluble in acids, which it neutralizes, being a powerful base of the same class as magnesia. It combines also with some of the alkalies. Several of the salts of zinc are employed in medicine and the arts; as the sulphate, which is used in calico printing, and in medicine as an astringent, a caustic, an emetic, and a tonic; the oxide and the carbonate, used as pigments, etc. Sheet-zinc is largely employed for lining water cisterns, baths, etc., for making spouts, pipes, for covering roofs, and several other architectural purposes. Plates of this metal are used as generators of electricity in voltaic batteries, etc.; they are also employed in the production of pictures, etc., in the style of woodcuts. (See Zincography.) Zinc is much employed in the manufacture of brass (see Brass) and other alloys, and in preparing galvanized iron.

ZINC-BLENDE, native sulphide of zinc, consisting essentially of sulphur and zinc, but often containing a considerable proportion of iron.

ZINC ETCHING, a process for making printing plates on which the lines or dots composing the picture are raised in relief, the blank spaces corresponding to the white paper between them being sunken so as not to receive ink or touch

the paper which is impressed against the lines in the printing press. The subject to be reproduced may be a pen drawing or crayon, or a print from a wood cut, steel engraving, etching on copper, or lithograph. It is necessary that the picture or print shall be in black upon white and that the surface represented shall be in distinct lines or dots. The copy is placed upon a flat board before a photographic camera and a negative made. This negative shows the light and shade of the copy reversed, and, when dry, is coated first with a solution of rubber to make it insoluble in the succeeding treatment, and when this is set, is again coated with a thick pellicle of plain collodion to give it body and strength. It is then, when dry, cut around on the edges and laid in a tray of acidulated water. After a few moments the film loosens from the glass and by careful handling is peeled from its support and laid face down upon another plate of glass. It is thus reversed to bring the print upon metal in the proper position to give direct impression when printed. A plate of zinc, usually about one sixteenth of an inch in thickness and about two inches larger in each dimension than the negative or group of negatives, is carefully polished to a brilliant luster and is coated with a solution of albumen, water, and bichromate of ammonia. The last named is the sensitizing agent and when the plate is dried it is easily affected by light, hence the operation is performed in a room where only a small amount of light is admitted through yellow glass. The negative is placed in a heavy printing frame, the sensitized metal plate laid upon it, and then brought in perfect contact by means of heavy screws or strong levers attached to the back of the frame. The printing requires from three to ten minutes by the electric light or two to four minutes in sunlight. When the metal plate is removed from the frame the image is only faintly visible. The albumen has become insoluble in the lines of the picture, but is easily washed away between them. In order to give the image strength to withstand etching, the plate when removed from the plate holder is rolled up thinly with a greasy ink and a leather roller. It is then laid in a tray of water and after a few moments is developed by rubbing gently with a tuft of cotton. The coating of ink disappears and the picture shows in clear lines of black ink upon the bright metal. It is then dried and dusted over with a fine resinous powder and again cleaned under water, dried and warmed enough to cause the resin to melt. It is then etched in a weak solution of nitric acid until the lines show a slight relief. After drying the plate is dusted with powdered dragon's blood and bruned in, and the process repeated successively from each end and side of the plate, thus protecting all the exposed sides of the lines. It is then ready for another etching. This round of operations is repeated from three to six times, or until the plate is etched to a depth of one-half its thickness in the open spaces. It is then given to the blocker, who with a routing machine, routs out the larger open spaces between

the lines to a considerable further depth, saws off the waste zinc from the margins, nails it upon a base of wood or soft metal, trims the edges square and shaves the back down until the block is exactly type high. The block is then taken by the finisher, who removes any roughnesses or defects in the lines, leaving it ready for the printing press.

ZINC-WHITE, oxide of zinc, a pigment now largely substituted for white-lead as being less liable to blacken on exposure; but it has not an equal covering power.

ZINGIS KHAN. See Genghis Khan.

ZINZENDORF (tsin'tsen-dorf), Nicholas Ludwig, Count von, founder of the community of Moravian Brethren, or Herrnhuters, was born at Dresden in 1700. He worked assiduously in co-operation with congenial friends at creating a revival of religion in the Lutheran church. Having given an asylum on his estate to some persecuted religionists from Moravia, and built for them the village of Herrnhut, he settled among them, and by degrees established there a common worship, and a missionary and industrial organization based on the family, not on the monastic system. This association became known throughout the world as the Moravian Brethren. To the extension of its influence Zinzendorf devoted his fortune and his energies, visiting in the course of his journeys England and America. He died in 1760.

ZINZIBERA'CEÆ, a natural order of plants, of which the genus Zinziber (ginger) is the type. The species are all tropical plants, or nearly so, the greater number inhabiting various parts of the East Indies. They are generally of great beauty through the development of their floral envelopes and the rich colors of their bracts; but they are chiefly valued for the sake of the aromatic and stimulating properties of the rhizome or root, found in ginger, galangal, zedoary, cardamoms, etc.

ZION, a mount or eminence in Jerusalem, the royal residence of David and his successors. See Jerusalem.

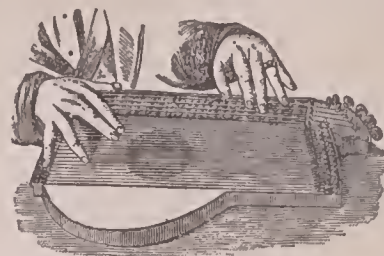
ZIRCON, a mineral, silicate of zirconium, originally found in Ceylon, and forming one of the gems, being met with either colorless or colored—red, brownish, green, etc. Hyacinth and jargon are varieties.

ZIRCONIA, the oxide of zircon, a hard, white solid, "sticks" of which are sometimes used in the oxyhydrogen flame instead of lime.

ZIRCONIUM, the metal contained in zircon and certain other rare minerals; symbol, Zr; atomic weight 90. It appears to form a link between aluminium and silicon.

ZITHER, **ZITHERN** (tsit'ér, tsit'èrn), a stringed musical instrument consisting of a sounding-box pierced with a large circular sound-hole near the middle, the strings, to the number of thirty-one in the more perfect forms of the instrument, being made of steel, brass, catgut, and silk covered with fine silver or copper wire, and tuned by pegs at one end. Five of the strings are stretched over a fretted keyboard, and are used for playing the melody, the fingers of the left hand stopping the strings on the

frets, the right-hand thumb armed with a metal ring, striking the strings. These strings, which are tuned in fifths, have a chromatic range from C in the second space on the bass staff to D on the sixth



Zither.

ledger-line above the treble. All the remaining strings, called the accompanying strings, are struck by the first three fingers of the right hand, and being unstopped produce only the single tone to which they are tuned. The instrument while being played rests on a table with the key-board side nearest the performer.

ZOAN, the Tanis of the Greeks and Romans, an ancient Egyptian city, on the right bank of what was the Tanitic bank of the Nile, now only a canal. It was probably the residence of the Pharaoh of the Exodus, and consequently the scene of the "marvelous things" that were done "in the field of Zoan" (Ps. lxxxviii. 12). The temple was one of the grandest in Egypt. Its ruins, buried under mounds, have been explored, and one of the chief curiosities found in them is the Canopus stone, with a trilingual inscription, like that on the Rosetta stone, hieroglyphic, demotic, and Greek, recording a decree of Egyptian princes assembled at Canopus B.C. 254.

ZO'DIAC, an imaginary belt or zone in the heavens, extending about 9° on each side of the ecliptic. It is divided into twelve equal parts called signs. It was marked out by the ancients as distinct from the rest of the heavens because the apparent places of the sun, moon, and the planets known to them were always within it. This, however, is not true of all the planets. See Ecliptic.

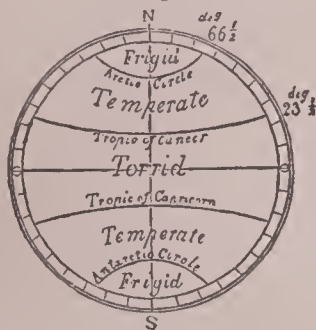
ZODI'ACAL LIGHT, in astronomy, a luminous tract of an elongated triangular figure, lying nearly on the ecliptic, its base being on the horizon, and its apex at varying altitudes, seen at certain seasons of the year either in the west after sunset or in the east before sunrise. It appears with greatest brilliancy within the tropics, where it sometimes rivals the Milky Way. The most plausible hypothesis respecting it is that it consists of a continuous disc, probably of meteors revolving round the sun.

ZOLA, Emile, French novelist, born in 1840, the son of an Italian engineer, died in 1902. After working for Paris publishers and writing for the press he attempted fiction. He first became generally known by commencing, in 1871 the famous series of novels entitled *Les Rougon Macquart Histoire Naturelle d'une Famille sous le Second Empire*. They were based on a theory that it is the duty of the modern novelist to depict human life, in all grades of society, exactly as it is, omitting and softening

nothing, however repulsive and disgusting. L'Assommoir, portraying the evil consequences of drunkenness, was dramatized by Charles Reade as "Drink," and became popular. Among Zola's other novels are *Nana*, *Germinal*, *L'Œuvre*, *La Terre*, *La Bête Humaine*, *La Débâcle*, *Dr. Pascal*, *Lourdes*, *Rome*, *Paris*, *Labor*, *Money*, *Fruitfulness*.

ZOLLVEREIN (tsol'vēr-in), the German customs union, the precursor of the present German empire, founded in 1827, and afterward greatly extended through the efforts of the government of Prussia. Its principal object was the establishment of a uniform rate of customs duties throughout the various states joining the union. The territories of the Zollverein now coincide with those of the German empire, and include also Luxembourg.

ZONE, (1) in geography, one of the five great divisions of the earth, bounded by circles parallel to the equator, and named according to the temperature prevailing in each. The zones are: the torrid zone, extending from tropic to tropic, or $23\frac{1}{2}^{\circ}$ north and $23\frac{1}{2}^{\circ}$ south of the equator; two temperate zones, situated between the tropics and polar circles, or extending from the parallel of $23\frac{1}{2}^{\circ}$ to that of $66\frac{1}{2}^{\circ}$ north and south,



Zones of the earth.

and therefore called the north temperate and south temperate zone respectively; and two frigid zones, situated between the polar circles and the north and south poles. (See Climate.) (2) In natural history, the name is given to any well-defined belt within which certain forms of plant or animal life are confined; as the different belts of vegetation which occur as we ascend mountains.

ZO'OID, in biology, an animal organism, not independently developed from a fertilized ovum, but derived from a preceding individual by the process either of fission or gemmation.

ZOOLOGICAL GARDENS, a public garden in which a collection of animals is kept. The gardens of the Zoological society, Regent's park, London, (familarly termed "the Zoo"), founded in 1828, are probably the finest of the kind in the world. They belong to the Zoological society of London, which was founded in 1826, among its promoters being Sir Humphrey Davy and Sir Stamford Raffles. Of the other chief zoological gardens, the Jardin des Plantes in Paris is the oldest, having been founded in 1794. In the United States there are Zoo's in all the large cities located generally in one of the parks. Those in Central park, New York, and Lincoln park, Chicago, are noteworthy.

ZOOLOGICAL STATIONS, stations or centers which have of late years been established in various parts of the world for the study of zoology. The Stazione Zoologica, at Naples, founded mainly by Dohrn in 1872, is of an international character. Other institutions of the same kind on a smaller scale have been established in various parts of France, Russia, America, and Scotland.

ZOOLOGY, that science which treats of the natural history of animals, or their structure, physiology, classification, habits, and distribution. The term "natural history" has been frequently used as synonymous with zoology; but such a term is obviously of wider significance, and should be used to indicate the whole group of the natural sciences. Zoology is a branch of biological science, constituting, in fact, with its neighbor branch botany, the science of biology. Its study comprehends such branches as the morphology of animals, or the science of form or structure, which again includes comparative anatomy, by which we investigate external and internal appearances, the positions and relations of organs and parts; the development of animals, which treats of the various stages leading from the embryonic to the mature state; the physiology of animals, which includes the study of the functions of nutrition, reproduction, and of the nervous system; classification or taxonomy, which assigns to the various individuals their proper place in the scale of life. A new department has been added in recent times, sometimes called etiology, which investigates the origin and descent of animals, or treats of the evolutionary aspect of zoological science. Various systems of classification have been framed by zoologists. Linnæus divided the animal kingdom into six classes, viz.: Mammalia, Birds, Fishes, Amphibia, Insects, and Worms (Vermes). Cuvier proposed a more scientific arrangement. He divided the animal kingdom into four sub-kingdoms, viz.: Vertebrata, Mollusca, Articulata, and Radiata. Modern classifications have been based chiefly on morphological characters, with the addition of the study of cellular empyryology, and the facts of heredity and adaptation. They have been very largely influenced by the theory of evolution, which has induced many naturalists to arrange animal forms as nearly as possible on the lines of descent from which they are believed to have originated. Among those who have modified the classification of Cuvier may be noted Lamarck, Ehrenberg, Owen, Milne-Edwards, Von Siebold, Leuckart, Agassiz, Huxley, Haeckel, Müller, Dohrn, Ray Lankester, and others. Professor Huxley recognizes the following sub-kingdoms: Vertebrata, Mollusca, Molluscoida, Annulosa, Annuloida, Coelenterata, Infusoria, and Protozoa. Haeckel's classification gives the broad divisions—Vertebrata, Arthropoda, Echinodermata, Mollusca, Vermes, Zoophyta, and Protozoa.

ZOOSPORE (zō'os-pōr), a spore occurring in cryptogamic plants, which, having cilia or long filiform moving processes projecting from its surface, moves spontaneously for a short time after

being discharged from the spore-case of the parent plant.



Zoospores.

ZOROAS'TER, one of the great religious teachers of the East, the founder of what was for centuries the national religion of Persia, and is still adhered to by the Parsees. He has been represented by eminent authorities as purely mythical, but it seems more reasonable to believe that he was a real and historical personage. If this view be accepted, he was probably a native of the east of Iran, but there is great uncertainty as to the time in which he appeared as a religious teacher. He is supposed by some to have been a contemporary of Moses, by others his date is assigned to the 10th century before Christ. His doctrines are to be found in the Parsee scriptures called the Zend-Avesta (which see), and the Gâthâs, which is the oldest part of that work, are declared to contain his authentic utterances. The fundamental idea of his doctrine was the existence, since the beginning, of a spirit of good, Ahurô Mazdâô (Ormuzd), and a spirit of evil, Angrô Mainyush (Ahriman). These two are in perpetual conflict, and the soul of man is the great object of the war. Ormuzd created man free, so that if he allows himself to fall under the sway of Ahriman he is held to be justly punishable. When he dies his good and evil deeds will be weighed against each other, and accordingly as the balance is struck will be sent to heaven or to hell. If they are exactly equal, the soul passes into an intermediate state, and remains there until the day of judgment. Ormuzd is to triumph ultimately, and then there will be one undivided kingdom of God in heaven and on earth. The religion of Zoroaster, when it became that of Iran, was expounded by a widely-spread priesthood, and these provided for it a ritual and ceremonial. Minutely elaborated laws for the purification of soul and body were laid down. They included a prohibition of the burning or the burying of the dead bodies of believers, which, by the Parsees in Bombay and elsewhere, are still left to be devoured by vultures. See Fire-worshippers, Parsees.

ZOUAVES (zwāvz), originally mercenaries belonging to a Kabyle tribe. The Zouaves in the pay of the Dey of Algiers were, when Algeria became a French possession, incorporated with the French army there, preserving their Arab dress. Ultimately the native element was eliminated, and the Zouaves became merely French soldiers in the picturesque Arab costume. As such they distinguished themselves in the Crimea and the Franco-Italian war of 1859.

ZUG (tsöh), a central and the smallest undivided canton of Switzerland, bounded by Zürich, Schwyz, Lucerne, and Aargau. Area, 923 sq. miles; pop. 25,045.—Zug, the capital, stands on the north shore of the lake, is 12 miles north-east of Lucerne, with which and with



SEE REAR FOR EXPLANATION.

ANIMALS.



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|-----|---|------------------|
| No. | 1. Elephant. <i>Elephas africanus</i> , | Africa. |
| | 2. Giraffe. <i>Giraffa camelopardalis</i> , | Africa. |
| | 3. Ibex. <i>Capra ibex</i> , | Europe. |
| | 4. Rocky Mountain Goat, <i>Haplocerus montanus</i> , . . . | North America. |
| | 5. Rocky Mountain Goat, young male. <i>Haplocerus montanus</i> ,
. | North America. |
| | 6. Rocky Mountain Goat, young female. <i>Haplocerus montanus</i> ,
. | North America. |
| | 7. Kangaroo. <i>Macropus major</i> , | Australia. |
| | 8. Llama. <i>Auchenia llama</i> , | South America. |
| | 9. Bison. <i>Bison americanus</i> , | North America. |
| | 10. Lioness. <i>Felis leo</i> , | Asia and Africa. |
| | 11. Lion. <i>Felis leo</i> , | Asia and Africa. |
| | 12. Striped Hyena, male. <i>Hyæna striata</i> , | Asia and Africa. |
| | 13. Striped Hyena, female. <i>Hyæna striata</i> , | Asia and Africa. |

Zürich it is connected by railway. Pop. 5160.—Lake of Zug, or Zugersee, chiefly in the canton of Zug, 9 miles long north to south, and in breadth from 3 miles to 1 mile. The shores are low in all directions except the south and southeast. In the former direction the Rigi with Mount Pilatus towering behind it, and in the latter the Rossberg, rise in lofty precipices, presenting scenery of a grand description. At the foot of the Rossberg the lake is 1200 feet deep. The fishing, principally pike and carp, is productive.

ZUIDER- (or Zuyder) **ZEE**, a gulf of the North sea, on the coast of Holland; 80 miles long, 40 miles greatest breadth. It was formerly a lake, but was united with the German ocean by inundations in the 12th and 13th centuries. The islands Texel, Vlieland, Terschelling, Ameland, etc., separate it from the North sea, with which it communicates by various channels, the principal being Hellsdeur (Hell-gate), between the Helder and Texel. It is very shallow, and to avoid the difficulties of its navigation to Amsterdam the North Holland canal was constructed. There is a proposal to inclose certain areas of it by means of dams or dikes, and by pumping and drainage to add much reclaimed land to the country.

ZU'LULAND, a South African territory northeast of Natal, and under its government. Inland it is bounded chiefly by Natal, the Tugela being the southern boundary; on the north it has Tongaland, on the east the Indian ocean. The Zulus are a warlike Kaffir tribe, and for a time were formidable to the colonists of Natal, possessing an organized army of considerable numbers. In 1879, under their king Cetewayo, they came into conflict with the British. At first the war was unfortunate for the British, but in July, 1879, a general engagement took place at Ulundi, where the power of the Zulus was crushed. Etshowe is the seat of the resident British commissioner, who is under the governor of Natal. The holding of land

by Europeans is not permitted, except for missionary, trading, or mining purposes. The minerals of the country include gold and coal. Area, about 10,000 sq. miles; estimated population, about 200,000.

ZÜRICH (tsü'rih), a town of Switzerland, capital of the canton of the same name, is beautifully situated at the northern end of the Lake of Zürich, on both sides of the Limmat, and having on the west the Sihl, which joins it immediately below. It has a university and a polytechnic school, both occupying handsome buildings, a Romanesque cathedral of the 11th-13th centuries, town-hall, public library, etc. Its most considerable industry is that of silk, but its cotton-spinning and manufacture of locomotives and machinery are also important. Its inhabitants are mainly German speaking Protestants. Pop. 152,942. It is one of the northern cantons and extends from the lake of the same name to the Rhine, to which its waters are carried by the Thur, Töss, Glatt, and Limmat. There are extensive manufactures of silk and cotton goods. Area, 655 sq. miles. Pop. 430,336.

ZÜRICH, Treaty of, signed there 10th November, 1859, by the plenipotentiaries of France and Austria, embodied the conditions of the preliminaries of peace agreed to at Villafranca, on the part of Napoleon III. and the Emperor of Austria, Francis Joseph, and closed the Franco-Italian war by Austria's abandonment of her right to Lombardy.

ZUYDER-ZEE. See Zuider-Zee.

ZWICKAU (tsvik'ou), a town of Saxony, 60 miles w.s.w. of Dresden. Zwickau has manufactures of linen and cotton goods, dyes, and chemical products, etc. Pop. 55,829.

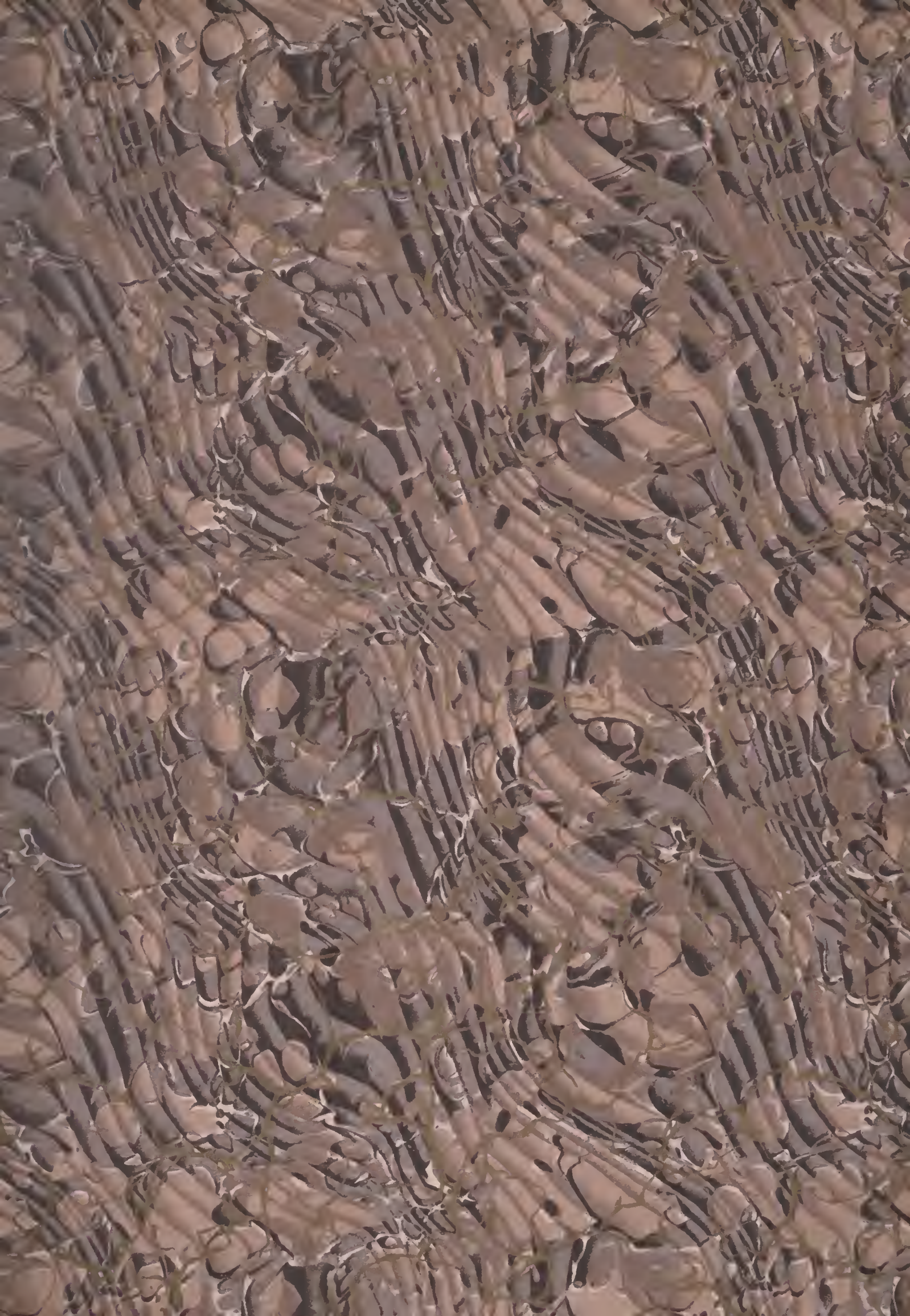
ZWINGLI, or **ZUINGLIUS**, **ULRICH**, the Swiss reformer, was born in the canton of St. Gall. His first overt revolt against the Roman Catholic system was when he was a priest at Einsiedeln (1516), which a supposed miracle-working image of the Virgin had made a favorite resort of pilgrims. He denounced

the superstition of pilgrimages so effectively that his sermons were talked of in Rome, and it is said futile offers of promotion were made to bribe him into silence. In 1518 he was appointed preacher in the cathedral of Zürich, where he denounced and baffled a vendor of indulgences. Then followed other denunciations of Roman Catholic practices and doctrines, until Zürich, the authorities of which supported Zwingli, and the people of which adhered to him, became thoroughly Protestant, and adopted a reformed theology, worship, and discipline. Zwingli went further than Luther, whose doctrine of consubstantiation led to what proved on the whole a resultless conference on the subject between him and Luther and Melancthon at Marburg in 1528. In 1531 the Forest Cantons, which adhered to the Roman Catholic faith, made war upon Zürich, whose troops Zwingli accompanied as chaplain. While in the thick of an engagement at Kappel, near Zürich, he was mortally wounded, October 11, 1531.

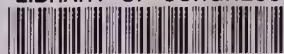
ZWOLLE (zwol'lè), a town of Holland, capital of the province of Overijssel. Zwolle communicates with the sea by means of the Willemsvaart canal. Among its industries are ship-building, cotton-manufacture, tanning, rope-making, etc. Three miles from the town is the monastery of the Agnetenberg, where Thomas à Kempis spent most of his life. Pop. 30,848.

ZYMOTIC DISEASES, a name applied to epidemic and endemic, contagious diseases, because they are supposed to be produced by some morbid principle acting on the system like a ferment. This morbid principle or poison gets into the blood in minute particles or germs, which there increase and multiply the disease lasting until the poison has become worked out, or has been destroyed. The chief of these diseases are measles, scarlet-fever, small-pox, typhus, typhoid, diphtheria, hooping-cough, croup, and erysipelas.





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